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THE FUTURE OF IRIS-INCLUSION IN GLAUCOMA

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IN this paper is given the basis of a firm faith, strengthened by recent experience, in iris-inclusion as inevitably the future treatment for many chronic primary glaucomas. But the paper would not have been written had it not been necessary to introduce a new and much needed item in operative technique that alters the outlook materially.

The Need for Iris-inclusion

No one can maintain that there is not much room for improvement in many of the final results of the various iris-free operations now performed, or can show much reason to doubt that the limit of achievement in this direction has probably been reached.

The main defect of all iris-free drainage, apart from early operative risks, is now fairly obvious. It can be summed up in the statement that there is no assured happy mean in this form of relief. Despite all efforts, frequent disappointment is met with in attempts to steer a safe course between excessive localized drainage, as shown by conjunctival blebbing, with or without hypotony, on the one hand, and the liability to early or late return of glaucomatous tension on the other hand.

From the earliest days of iridectomy the frequently observed time-limit to the relief afforded has been a great drawback of the operation. By small flap sclerotomy a few surgeons have obtained a large proportion of possibly permanent successes, with

perfectly diffused drainage. I recently saw two such eyes in a patient operated upon by myself 17—18 years before, and the brother of this patient, similarly operated upon about the same time has equally good results.

But unfortunately there is no known way of ensuring such enduring results from this operation always, and some surgeons have been very unsuccessful with the method, probably, as Mr. Reginald Bickerton has suggested, through fear of touching the iris—not going deeply enough in making the scleral puncture.

My own very limited experience of late results of trephining, performed by various surgeons, suggests that in eyes that have been thus operated upon, and in which there is no conjunctival vesiculation, there is a greater liability to recurrence of tension than in eyes with linear filtering scars secured by either of the above-mentioned operations. It would be interesting to know whether others with larger experience of trephining results, are able to confirm the above impression that limitation of the area of moderate drainage—drainage unaccompanied by conjunctival blebbing—tends greatly to limit the period of effective relief obtained.

I did not realize till recently how much the gravity of a late return of glaucomatous tension may be enhanced by insidiousness of onset, particularly when there are no available records of the visual field.

A patient came nearly seven years after a trephine operation, thinking she did not see quite so well as formerly. With slight astigmatic correction her visual acuity was nearly 5/6. The local condition seemed surgically perfect, in that there was no trace of conjunctival vesiculation. The trephine hole could not be seen, and there was some definite cicatricial tissue in part of the area of reflexion of conjunctival flap. I was quite certain that there was no glaucomatous tension at the time. But there had been some early history of slight transient congestive attacks before her operation, and the corneae were slightly small. Later history suggests that possibly there were transient elevations of tension at that time, at night, at least. The fellow eye was blind and hard from absolute glaucoma.

Fourteen months later she went again to the well-known surgeon who had trephined her eye. I believe her vision had then definitely deteriorated. But he evidently found no plus tension. He must have taken the case to be one of progressive optic atrophy, in spite of full relief of glaucomatous tension, since his verdict was that there was nothing more to be done. Greatly disappointed, she resigned herself to the oncoming blindness. Finally, in despair, she was brought to me again nearly blind, more than three years after I had first seen her.

The tension was + 1, and the vision was reduced to the counting of one or two fingers at 2—3 feet distance in a small portion of the outer field.

I performed an iridencleisis operation immediately to the inner side of the area of adherent conjunctival flap, up and in. The result has been unsatisfactory from my point of view, in that the early promise of fibrosis over the prolapsed iris, in the form of dilated conjunctival blood-vessels, failed to materialize. There is a conjunctival bleb, due, I believe, to restriction of sub-conjunctival diffusion of aqueous above the cornea by the firmly adherent conjunctival flap of the trephine operation. (Diffusion beneath the neighbouring conjunctiva to the inner side of the cornea is also limited, since the conjunctiva exposed in the palpebral aperture is normally somewhat adherent).

The patient, however, has been most grateful for the steady improvement in vision that progresssd up to the time when I last saw her, nine months after the operation. She then saw one or two letters of 5/20.

The Promise of the Future: A Technical Detail

Hitherto I have shrunk from the responsibility of recommending expressly the fairly general adoption of iris-inclusion, (1) because of failure to get rid entirely of the conjunctival bleb, with its presumptive risk of late infection, and (2) because of the need for insistence upon measures to be taken to eliminate the risk of sympathetic ophthalmitis.

Now I believe it can at last be claimed that the needful control over conjunctival changes has been secured—not through any elaborate deduction from preconceived ideas or from basic principles— but simply from observation of the effects of rare instances of unintentional irido-dialysis, produced during glaucoma operations.

Latterly in most of my operations for chronic primary glaucoma the iris has been purposely detached from its base locally by the downward pull of iris forceps, before being drawn up to be cut meridionally with scissors beneath the conjunctiva. The number of cases so treated has been small, but in every case a perfect result has followed. There is reason to hope, therefore, that this small and apparently insignificant addition to ordinary technique marks the final development of the principle of iris-inclusion, the fruit of years of effort.

The Perfect Result

Some of those who have practised deliberate iris-inclusion have been far too content with very inferior results, including apparently all grades of conjunctival vesiculation and rarefaction.

Iridencleisis cannot justify itself unless it brings with it a reasonable hope of securing always a near approach to the perfect result —assuredly permanent and full relief of tension, together with complete protection against late infection, as provided by localized conjunctival fibrosis. It seems strange that little notice has been taken of this most desirable development of new fibrous tissue in the conjunctiva covering an iris-prolapse, extending down into, and practically replacing the iris tissue, yet not interfering in the least with efficient drainage of aqueous into the surrounding subconjunctival tissue. (See photo-micrographs by Verhœff, *Arch. of Ophthal.* XLV, 1916, p. 5, and by Holth, *Brit. Jl. of Ophthal.*) IV, 1922, p. 13; both reproduced in my small book on the Operative Treatment of Glaucoma, 1923).

This fibrosis—apparently a result of friction and pressure of the upper lid upon the locally elevated conjunctiva—is always preceded by a quite early appearance of dilated and tortuous conjunctival blood-vessels, that evidently have much to do with the new formation of tissue. The enlarged blood-vessels are very noticeable within a week, over the whole field of operation, and though they mostly disappear later, a few generally remain larger than normal.

It is not perhaps entirely clear why irido-dialysis should be so effective in ensuring this localized fibrosis, this protective fibrous shield. The explanation is probably to be found chiefly in the fact that the dilatator muscle of the iris is put out of action locally. Having no basal attachment, it cannot draw the prolapsed iris back into the eye. The sphincter of the pupil has also been put out of action temporarily in my operations, by the combined use of cocaine, adrenalin and atropine. And owing to the basal detachment, the iris lying under the conjunctiva forms a tongue of tissue, apparently of the right size, that can be floated forwards by aqueous, while yet allowing free escape of the fluid on both sides.

My first attempt to utilize deliberate irido-dialysis to ensure conjunctival fibrosis was a great failure, and most discouraging. Having detached the iris, I simply drew out the bridge of tissue and left it under the conjunctiva. But the extent of iris tissue was too great for the whole of it to be elevated by outflowing aqueous. In consequence, the aqueous found a way through the iris, and produced a conjunctival bleb. The result compared very badly with the perfect fibrosis that had been secured earlier in the fellow eye by older technique.

Security in Operating

When it is fully realized that the desired result, as given above, is uniformly obtainable in the average primary glaucoma by any

really careful operator of quite moderate experience, I believe that nothing can stop the rapid advance of the practice of iris-inclusion.

There is nothing difficult in the operation. It is, in fact, one of the simplest imaginable. And it becomes, apparently, one of the safest of all glaucoma operations if the available safeguards are fully used.

The shortness of the necessary straight sclero-corneal incision —varying a little with the thickness of the iris forceps that are to be introduced, but in any case not longer than about 3·5 mm. at the deep surface of the cornea—prevents any long delay in refilling of the anterior chamber, with its possible evil consequences.

Among preparatory measures is the omission of miotics after 4 or 5 p.m. of the day preceding operation. If this rule is not observed, it may be difficult to dilate the pupil sufficiently at the time of operation, the dilatation being needed to prevent the pupillary sphincter drawing the prolapsed iris partly back into the eye after operation.

In place of the miotic a saline purgative is given, varying with circumstances, to lower the intra-ocular tension. This, together with adrenalin instillation before operation, appears to guard sufficiently against the possible complication of retinal or choroidal haemorrhage.

Even in hard eyes, in congestive glaucoma, such preparation freely used, together with limitation of the incision to the absolute minimum, appears at least to exclude the risk of expulsive haemorrhage.

Conjunctival antisepsis of proved efficacy is essential to remove the reproach of possible sympathetic ophthalmitis (see below). One must act upon the admission that one failure in this respect, one instance of the disease among a hundred good results, would be enough to condemn the whole undertaking.

The final safeguard of a strictly sub-conjunctival operation completes the list of precautions.

Past History

It is necessary to add that the provisional claim of securing absolute and unvarying permanency of relief of tension is based on my experience.

I have never known nor heard of a late return of tension following satisfactory intentional or unintentional iris impaction in primary glaucoma. There have been cases of imperfect drainage from the beginning. This is a different matter. I remember a Bombay case with fibroid inelastic iris and rigidity of pupil, in which iris-inclusion gave incomplete relief. And imperfect drainage has been seen where only a tag of stretched and torn iris has been fixed in the sclero-corneal wound.

I began operating by iris-inclusion methods in the year 1900 with insufficient safeguards. The incision at first was considerably larger than necessary. In consequence, there were some protracted delays in refilling of the anterior chamber (*Trans. Ophthal. Soc., U.K.*, XXIII, 1903, p. 329) leading to trouble in a few instances, including early recurrence of plus tension, cataract formation, and contraction of visual field. There may have been rupture of the zonule rarely.

At first there was no measured perchloride irrigation of the conjunctiva. Hence, a case of sympathetic ophthalmitis and one of ordinary iritis.

Priestley Smith's equatorial puncture was practised as an aid in some hard eyes until an instance of infection of the vitreous occurred.

In recent years, the only slight complication requiring mention has been an occasional superficial injury to the lens, by iris forceps or blunt iris hook. These slight flaws, seen as surface markings, have not extended far enough to affect vision appreciably. The longest of them was in a case in which the blunt hook had to be used, owing to the corneal incision (made in this instance with a 1 mm. Graefe knife) being too small at the deep surface of the cornea.

I can remember no trouble from haemorrhage since the early days of my 1903 report (*Trans. Ophthal. Soc. U.K.*) But in India one did not examine the fundi after operation, except for some special reason.

In this respect quite the last of my operations may be mentioned. The vision of the fellow eye, which was only slightly glaucomatous, was much reduced by numerous retinal haemorrhages, and at a recent operation for appendicitis on this patient, it had been noted that the arteries concerned were hard and "brittle." The glaucoma in the eye upon which I operated was advanced, with considerably contracted field, and tension not fully reducible by eserine. The only chance of saving useful sight for a long period evidently lay in operation. This was performed quite satisfactorily after due preparation of the patient (aged 67 years).

Rationale

It is quite time that it was generally recognised that iris tissue lying in a sclero-corneal wound accomplishes something in the matter of drainage, that nothing else can ever do. It does almost exactly what is wanted, no more and no less. Apparently it is not too much to suggest that the results probably represent the highest possible limit of attainment in glaucoma treatment.

I used to think that the lining of pigment epithelium was the only thing that mattered in the sclero-corneal track. Now I feel sure that much of the permanency of quite moderate drainage that is secured, is closely related to the observation (emphasized, if not made originally, by Thomson Henderson) that a cut iris may remain permanently unhealed. Evidently none of the cells forming the stroma of the iris is capable of forming new fibrous tissue, granulation tissue. One may suppose that the filter formed by spongy iris tissue in a sclero-corneal wound, helps to avoid the two extremes—excess and defect in drainage. The filter probably from the first restrains the flow of aqueous, preventing marked hypotony, and at the same time effectively resists closure of the track, and so ensures permanent relief of the glaucoma.

Glaucomatous tension associated with past or present iritis or irido-cyclitis is in general quite unsuited for treatment by iridencleisis.

Elsewhere I have mentioned the complete disappearance of prolapsed iris by contraction of new fibrous tissue in the prolapse that was seen after iris-inclusion operations upon eyes that had formerly suffered from irido-cyclitis.

Of more importance is recognition of the fact that the displacement and nipping of iris in a sclero-corneal wound—that is, an iris-inclusion operation—evidently places the iris at a disadvantage in dealing with infective bacteria. This was the lesson inculcated by the recurrence in aggravated degree of a previous intermittent bilateral rheumatic iritis, that followed an iris-inclusion operation, as reported in the *Brit. Jl. of Ophthal.*, X, 1926, 380—4.

The same inference is to be drawn from a recent case of plus tension in both eyes, associated with a tendency to slight iritis, and with a good deal of vitreous opacity, mainly coarse, and stringy, in a patient with swollen and deformed finger joints. I performed a small flap sclerotomy with a small iridectomy on one eye. But as the effect on the plus tension seemed not quite sufficiently prolonged, in performing a similar operation later on the fellow eye, I added a very limited inclusion of iris, drawing the iris into one of the lateral incisions of the small flap. The object was mainly to prop the scleral flap a little forwards. Whereas the eye first operated upon remained quite quiet, the second eye, in which the iris was displaced, flared up sharply for rather more than a week. There was considerable swelling of the lids and pain, and perhaps a trace of muddiness of the iris, that gave way slowly to atropine.

The Elimination of Ectogenous Infection, including Sympathetic Ophthalmitis

The crux of the whole question of deliberate iris-inclusion lies, of course, in the possibility of total exclusion of the risk of sympathetic disease. Treatment by iris-incarceration has been condemned so whole-heartedly on account of this risk "as a matter of principle" by surgeons in authority in this country, that the hands of a younger generation are thereby largely tied. At present the less experienced will naturally hesitate in face of a prohibition that will in time, I hope, be justly regarded as an unwarranted confession of helplessness, and a bar to progress.

The Problem

In dealing with an unknown infective agent, the question of its exclusion must be essentially a clinical one. Clinical experience must outweigh inferences to be drawn from laboratory findings with regard to recognised bacteria. One can only hope to extend to the utmost such defensive measures as seem to have been successful hitherto in preventing sympathetic ophthalmitis, while also excluding ordinary septic invasions.

The only collective evidences large enough to be convincing, of which I am aware, are comprised (1) in the history of the war, and (2) in large Indian operative experience, particularly in cataract work.

Sir John Parsons in his manual, "Diseases of the Eye," 6th Edition, 1930, p. 440, says that sympathetic ophthalmitis "was very rare during the Great War. This gratifying fact is due to increased skill in the treatment of penetrating wounds, particularly in the application of antiseptic principles."

Such observations can only mean that by such measures as the cleansing of wounds, so far as possible, the excision of prolapsed or incarcerated uveal tissue, and the removal of foreign bodies, the unknown infective agent was generally excluded or removed, or its effects overcome. It seems perfectly plain dealing with an outside organism, that had occasionally got beyond the reach of early preventive or of curative measures.

The issue is more clearly defined and narrowed down to preventive conjunctival treatment by operative experience in India. Though the incidence of the disease is admittedly lower in India than in Europe, yet the danger has always to be reckoned with there.

The available evidence is very strong that sympathetic disease can always be excluded in glaucoma work, if sufficiently strong, yet harmless, preventive measures are invariably adopted.

The empirical use of measured perchloride irrigation of the

conjunctiva, that enabled Colonel Elliot (*Trans. Ophthal. Soc. U.K.*, XXIV, 1914, pp. 280—1) and myself to eliminate suppurations and greatly to reduce the number of lower grade septic invasions in our cataract work, served also nearly to exclude sympathetic disease. (See my "Cataract Extraction," 1907, pp. 287—8). It is particularly noticeable that neither type of infection was entirely excluded—the septic or the sympathetic. Both types of disease were alike in showing that the routine preventive treatment had not been quite effective enough. Accordingly more of the solution was used later, and more time was given for it to act (see below).

Can it be merely an extraordinary coincidence that the only instance of the disease known to have followed an operation of any kind performed by me in England—a case of cataract extraction described in Appendix No. 2—occurred in the only eye in which the usual measured irrigation, before the cocaine instillation period, had been forgotten?

Further, the only case of the disease known ever to have followed a glaucoma operation of mine, during thirty-five years' ophthalmic practice, was the one mentioned above, that occurred quite at the beginning of the century, before regular conjunctival irrigation had been started in my work.

In support of all such individual experiences, the general feeling among experienced eye surgeons that the disease must represent an outside infection cannot be disregarded.

Two additional inferences must be drawn from clinical experience.

(1) If the disease is due to invasion by an unknown conjunctival organism, this organism obviously cannot be pathogenic to the conjunctiva. It must be present in some perfectly normal membranes, since the disease seems quite as prone to occur in eyes with normal conjunctivae as in others. Children are held to be particularly liable to the affection, including those with the thinnest, palest and smoothest membranes imaginable. Therefore, any preventive measures utilized in operating must be applied indiscriminately to all eyes alike.

This conclusion is strictly in accord with a suggestion that has been put forward to explain the spread of the disease from the exciting to the sympathising eye. The suggestion is that the spread is through the blood stream, by means of a virus that is pathogenic to uveal tissue only.

(2) The infective agent, though a non-pathogenic inhabitant of the conjunctiva, must yet be a parasitic one, not living wholly on the surface, but penetrating into the epithelial layers sufficiently deeply to be partly beyond the reach of the most powerful antiseptics that can be ordinarily used, preparatory to

operations. This conclusion follows from the experience that no amount of antiseptic conjunctival treatment can be relied upon surely to prevent the onset of the disease, if an uncovered prolapse of iris is allowed to remain.

It is important, therefore, in deliberate iris-impaction operations to act always on the assumption that the protection against sympathetic ophthalmitis afforded by antiseptic applications before operation is definitely time-limited, and possibly quite brief. An essentially transient influence upon the conjunctiva, however, is all that is needed in a purely sub-conjunctival glaucoma operation.

Practical Application

I feel strongly that no one should ever perform an iris-inclusion operation without having used one of the proved means of clearing away conjunctival bacteria. But no reliance can be placed upon laboratory findings on the germicidal power of various unirritating solutions, as measured by effects upon common bacteria. And the same possibly applies to reports of purely surface cleansing of the conjunctiva obtained by various applications, such as mercuro-chrome in two per cent solution (Friedenwald, J. S. and H., *Trans. Ophthal. Soc. U.K.*, XLV, 1924), and two per cent. yellow oxide of mercury ointment (Stanka, R., *Klin. Monats. f. Augenheilk.*, LXII, 1924, 432.)

Substances should be chosen that have a definitely "fixative" action on the superficial epithelium, such as silver nitrate or corrosive sublimate. One cannot expect to act directly upon organisms lying in the superficial epithelial layers, but one can fix them together with the epithelial cells, and one can remove them afterwards, together with the fixed cells, when the latter are shed, and the whole can be washed away in the mucus that is secreted. Preliminary treatment with unirritating applications cannot be objected to, provided it is regarded as auxiliary only.

Efforts with caustic or corrosive solutions should be concentrated on one single measured "maximal" application, on account of the variable slight inflammatory reaction that is to be expected afterwards. By the term "maximal" should be understood the strongest application—measured by the period of irrigation or by the strength of solution—that any particular conjunctiva can be expected to bear without unpleasant reaction. And time should be given always—roughly twenty minutes or more—for the full fixative effect to be attained before the operation.

The silver salt may be more suitable than the mercury salt. A few drops of one per cent. silver nitrate solution instilled an hour

before operation may be ample. (See Bell, G. H., *Arch. of Ophthal.* III, 2, 1930, p. 196 and earlier references there quoted.) But I do not know of any sufficiently extensive operative experience under this treatment to carry conviction with regard to its use in iris-prolapse operations. It is mainly a question of the strength of the solution, the amount of it used, and the time when it is used.

The instillation of a few drops of solution is certainly much less troublesome than measured irrigation.

I personally have naturally preferred the 1 in 3,000 sublimate solution that has been well tested by the large figures available in cataract work in India. It may be noted that the period of irrigation that sufficed to give the Indian results, above referred to, varied usually from 1¼ to 1¾ minutes, according to the clinical condition of the conjunctiva. This amount of irrigation was shown, by means of cultures on Löffler's serum—taken before the irrigation and again just before operating—invariably to remove all the purely surface organisms, xerosis bacilli and Morax-Axenfeld diplo-bacilli. But various cocci were certainly not always fully removed (See report in *The Ophthalmoscope*, IV, 1906, p. 674). Thus these bacteriological results were in conformity with the clinical evidence mentioned above, indicating the need for somewhat stronger measures. The results, both clinical and bacteriological, would probably have been more complete if the interval between irrigation and operation had been longer. It was often ten minutes only.

In this country in spite of the much more normal average condition of the conjunctiva, the minimum period of irrigation, both in cataract and glaucoma work, has been almost invariably two minutes. And the period has frequently been extended a little; occasionally, for particular reasons, up to two and a half minutes. And the time that has elapsed between irrigation and operation has rarely been less than twenty minutes. More often it has been longer, up to forty minutes. The exact time has depended upon quite another consideration— the influence of the cocaine and adrenalin on the pupil.

In guarding against such a deadly disease as sympathetic ophthalmitis, the surgeon must be personally responsible for the thoroughness of the preparation of the eye. A *visible* and *tangible* result of the irrigation is obtainable in the mucus that is secreted, to serve as a practical index of the total effect.

As judged in this way after an interval of 20—30 minutes the effect of a routine irrigation for two minutes varies considerably in conjunctivae of practically normal appearance. Usually there is a moderate but variable quantity of mucus that can be detached by movements of the everted lids upon one another, and washed

away with sterile water. Occasionally there is little or no mucus, and in this case additional irrigation for ½—¾ minute has been practised. Used thus, just before operating, one can still hope to obtain some of the immediate fixative coagulative action, that may be seen occasionally clinically in some rather delicate membranes during the first prolonged (two minutes') irrigation, in the form of a faint superficial cloudiness of the palpebral conjunctiva.

This variability in action of the antiseptic lotion is not very satisfactory in an operation that involves deliberate impaction of the iris in such a way as to handicap the iris in its ability to deal with infective organisms, as above indicated. On this account one must be prepared always to overdo the defensive irrigation at the cost of some transient subsequent pain, injection, and conjunctival discharge, rather than to run the slightest risk of underdoing the precautionary measures.

And the use of all available *overlapping* minor precautions in operative procedure is indicated.

Among the latter may be mentioned: Expression of Meibomian secretion, swabbing of lid margins, the use of a Lang or Lawford lid speculum to cover the lashes, placing the conjunctival puncture 6—7 mm. from the corneal margin, rapid rinsing of points of iris-forceps or scissors in the boiling water of a sterilizer, if by any chance they have to be introduced into the wound a second time. If prolapsed iris possibly extends rather near the conjunctival puncture, through the latter being misplaced, or through stretching of the iris, a little of the latter should perhaps be excised. And the edges of the conjunctival puncture may be temporarily pinched together by the fixation forceps.

Objections to Perchloride Douching

Maximal irrigation has been commonly rejected in cataract extraction as unnecessarily harsh. This cannot apply in iris-inclusion work, for the reasons given.

The usual standing order in my work, as regards after-treatment, is that all patients who wish for it shall have 1/12 gr. of heroin or 1/8 gr. of morphia hypodermically soon after operation, and that the dose shall be repeated, if wanted. The assurance thus given has generally sufficed. Few patients have cared to have the injection, and many of them seem to experience no pain at all.

Moderate conjunctival injection and a varying quantity of mucous discharge—chiefly sticking the lids together in the mornings—is the rule for a week or more. But this reaction does no harm whatever. It cannot weigh for a moment against the overwhelming combination of benefits claimed for iris-inclusion.

The reaction is not necessarily associated with a development of pathogenic properties in any cocci that may be present in the conjunctiva. This was shown in old Indian days by one or two cases of impaction of firm vitreous in the wound after cataract extraction. The vitreous in such cases did not necessarily become infected. I have seen it gradually covered in by new-formed fibrous tissue, the eye remaining quiet.

Conclusion

The theoretical side of the above argument may be disregarded; it is merely explanatory and unessential. The facts appear to me overwhelming. The essential permanency of iris-produced drainage required for its demonstration the lapse of years, and safeguarding by means of conjunctival fibrosis has taken years to develop, and there has always been the fear of sympathetic trouble to be exorcised by no uncertain means. So far as can be judged now the defence, fully applied, seems infallible. There has been no need in the above discussion to raise the question of septic risks, the consideration of this lesser evil being merged in that of the greater sympathetic menace.

On the evidence now available, is it any longer right to reject absolutely the only measure, iris incarceration, that gives the slightest promise of ever reaching near to 100% of permanent successes in glaucoma treatment? If further experience should give reason for doubt with regard to present means of securing temporary practical sterilization of the field of operation, surely we cannot have exhausted possibilities in this direction.

My chief fear is lest indiscriminate practice of iris-inclusion without the indicated safeguards should, by courting disaster, succeed merely in "putting the clock back."

Operation in Acute Glaucoma

The above does not apply without some qualification to painful congestive glaucoma of more or less sudden onset, generally with shallow anterior chamber and dilated pupil. But the treatment is not radically different.

In place of the old and well tried wide iridectomy I believe that by far the safest and best operation is the smallest sub-conjunctival iridectomy that can be made, leaving the iris incarcerated.

After purging and conjunctival irrigation or silver nitrate drops (?) and the use of adrenalin locally, whether under a general anaesthetic or novocaine sub-conjunctivally, the conjunctiva is slid on the point of a keratome for a moderate distance—5 mm. only. The keratome puncture is quite the smallest that will allow of the introduction of ordinary iris forceps and the pulling out of a small loop of iris. The end of the loop is snipped away, leaving the iris impacted on each side.

The pupil being more or less dilated from the glaucoma and the adrenalin used, a very obvious iris prolapse is found in practice to be unnecessary to secure permanent drainage. Atropine is used rather freely in the after-treatment, the fellow eye being guarded by eserine drops.

It is surprising how little artificial drainage is needed to keep the tension permanently down in these eyes. There is no conjunctival vesiculation, and often little or no oedema even. And it cannot be that the unhealed margins of the iris coloboma absorb much aqueous, impacted as they are in the wound.

Appendices

1. *Technique.*—To busy surgeons it may be a valuable saving of time to have the half hour's preparation of the eye done by a thoroughly reliable theatre sister, with an assistant. For this detailed instructions are needed.

In perchloride irrigation the solution can be dropped on the everted lids from a bowl with an ordinary eye-dropper, the lids being kept moving vertically, *i.e.*, towards the patient's brow and feet. In order that the upper tarsal conjunctiva shall be fully exposed, the eversion of the lid is maintained by pressure of the retaining finger on the eyelashes or lid border only. The period is two minutes exactly, unless a longer time, *e.g.*, two and a half minutes, has been ordered. Cocaine instillation, five grains in two drachms, is begun immediately afterwards, and an ophthalmic disc of adrenalin (? 1/110 grain) introduced after the first instillation. The instillations are repeated every two or three minutes, and a disc of atropine (? 1/200 grain) used generally after the second one. If the eye is not blanched at the time of the third instillation, a second adrenalin tabloid is used then, since it will be found to be useless later on. (I don't know the reason of this).

No eserine having been used after tea-time of the day before (for a morning or mid-day operation), the pupil should be rather well dilated in 20—25 minutes, exceptionally a little earlier; and it may be found that further instillations fail to enlarge the pupil more.

The surgeon has to move the everted lids upon one another to detach conjunctival mucus, to be washed away with sterile water. If there is little or no mucus, perchloride is substituted for the water and used for ½—¾ minute.

He may wish to squeeze the lids together in order to express Meibomian secretion, and swab the lid borders.

The site of the incision is often to one or other side, either to avoid the larger blood-vessels, or possibly because the patient does not look sufficiently downwards. The edge of the ordinary pattern bent keratome (small blade preferred) pushes the conjunctiva from a point 6—7 mm. from the corneal margin down nearly to the corneal margin, the exact point depending on the varying degree of overlapping of the cornea by the conjunctival limbus.

The knife point is pushed on into the anterior chamber, at first inclined somewhat towards the iris, very slowly and preferably with side-to-side movements, till the exact size wanted at the deep surface of the cornea is judged to have been produced.

The ordinary pattern of bent iris forceps is easily introduced through the subconjunctival pathway and so into the chamber. The points of very fine forceps are apt to be caught repeatedly in the conjunctival tissue.

The iris is well gripped and pulled slowly towards the centre of the pupil, till it is seen to have been torn from its base locally. There is no bleeding from the torn iris. It is then drawn up through the sclero-corneal wound, to be cut radially under the conjunctiva. Straight iris scissors are the more convenient for this. If de Wecker's scissors are used, short-bladed ones are best. Repeated snips are made because the effect cannot be seen sufficiently, often being hidden by blood or uveal pigment under the conjunctiva. It is not quite essential that the cut should reach the pupillary border, though this is aimed at. The iris is not released from the grip of the forceps until the cutting is completed.

2. *The origin of the sympathetic case* referred to on p. 441, following a cataract extraction, needs consideration.

The patient was in the care of another ophthalmic surgeon, though I performed the operation and was fully responsible for it. The nursing home was situated at a distance; it was new to me and to eye-work generally, I believe. I was so preoccupied in re-arranging lighting, etc., that I quite forgot to wash out the conjunctiva

with perchloride at the usual time, and failed to notice the omission till the cocaine instillation period was ended. To make up for this extraordinary lapse I irrigated for three minutes, instead of the usual two minutes, though the conjunctiva appeared quite normal. I doubt if I have ever irrigated for so long a period continuously, even in dealing with unheathy conjunctivae in India. As an additional precaution I made the sclero-corneal incision purely sub-conjunctival, by sliding the conjunctiva slightly on the point of the knife before making the puncture, and I made a rather longer conjunctival flap than usual.

The operation otherwise was uneventful. Next day the cornea was adherent to the upper lid, from the excessive irrigation practised. I left it so, and did not see the case again for some weeks, when there were large pale corneal precipitates found. Eventually, the fellow eye softened and shrank, in spite of " N. A. B." treatment, begun rather late. Vision in the operated eye was lost mainly, I believe, through plus tension due to an impermeable diaphragm formed of iris and pupillary membrane, pressed so closely against the cornea that repeated attempts to divide the membrane failed, till too late to save vision.

The chief point of interest is: how did the disease arise? Was the infection introduced at the operation through the irrigation being too late to be of use? Another explanation seems more likely. Owing probably to the pull of the adherent upper lid, the sub-conjunctival sclero-corneal incision gaped so widely, that there was a strong suggestion that even the conjunctival incision might have been pulled open at times by lid movements. The suggestion was that conjunctival organisms might have been sucked into the eye thus by the pull of the lid, after the transient protective effect of the perchloride had passed off. This explanation might appear far-fetched, were it not that this was my only post-operative case of sympathetic ophthalmitis in England, as already mentioned. For this unique result an exceptional explanation is not out of place. There was no iris prolapse nor visible incarceration, and the pupil was not displaced.

3. A friend wrote asking if I could explain " *recurrence of tension in spite of a ' cushion scar '*," *i.e.*, filtration oedema. The following case throws a good deal of light on the subject, which does not come under the title of this paper, but which I should like to mention here.

No less than four small flap sclerotomies were performed on one eye of a most considerate and most helpful patient, beginning in 1920. I am sure that the last two of the four operations had no permanent effect, and probably the second operation had very little effect, Yet there was conjunctival oedema, and the outlines of the various flaps remained clearly visible.

The tension, periodically measured, still showed the need for pilocarpine and massage, until finally the treatment came to an end by a satisfactory iris-inclusion operation in February, 1929. The latter was performed to the inner side of the former operations, where the conjunctiva was not sufficiently mobile to be freely " slid." Accordingly, as the first step in the operation, the conjunctiva was elevated by injecting air beneath it, with a hypodermic syringe. Air was chosen in preference to normal saline, partly because the latter differs in composition from aqueous humour. It was most unexpected to find that much of the air injected passed at once into the anterior chamber, filling the chamber with air bubbles. Since the air found its way so readily into the chamber, obviously the aqueous could have no difficulty in passing out beneath the conjunctiva through the sclerotomy wounds. Yet why should it not have become absorbed in the usual way? Why had it remained locked in sufficiently to keep the tension above normal?

Looking back, I am sure the explanation was supplied during the after-treatment of the fourth sclerotomy operation. Twice the use of atropine drops was pushed to the limit, eight or nine times daily, for a couple of days. This was done to try to dilate the pupil to some extent, the pupil being small, due to synechiae left by former operations. Unfortunately after the first operation atropine had not been used quickly enough to prevent one or two synechiae forming, and these had been added to at later operations. Finally on each of the two occasions just mentioned the free use of atropine, instead of quietening the eye, had the opposite effect. The eye flared up unmistakably, becoming painful and injected. I am sure that this inflammatory reaction, from excessive pull on the old posterior synechiae, must have led to inflammatory deposit of some kind in or beneath the conjunctiva, passing out from the blood-vessels of the iris through the recent sclerotomy wound.

And the same thing, less marked, must have taken place unnoticed, after the

earlier operations, to have accounted for permanent restriction of absorption of aqueous from the sub-conjunctival wounds.

It would be interesting to hear whether in other cases of this kind, unusual or prolonged post-operative reaction has been noticeable.

There was no trouble of any kind after the final iris-inclusion operation, and the posterior synechiae were not noticed at all at the operation. They were evidently very fine, and broke down at once. The prolapsed iris has become fibrosed, but the elevation is much more sharply defined and higher than usual, owing to restricted lateral diffusion of aqueous.

A CASE OF RING SARCOMA OF THE IRIS

BY

DOROTHY R. ADAMS

LONDON

History.—The patient, A. B., a mason's labourer, aged 44 years, was first seen on February 2, 1930, at the Central London Ophthalmic Hospital. He gave a history of a sudden attack of pain and inflammation in the left eye which began three weeks previously. The inflammation had subsided to some extent as the result of treatment, but the eye was still painful. Vision in that eye had been decreasing gradually for the past nine months, and was now lost almost entirely. There had been no previous attacks of inflammation.

Clinical examination.—The left eye had bare perception of light. It was much inflamed and showed both ciliary and conjunctival injection. The tension was + 2, and the cornea was hazy and oedematous. The anterior chamber was deep, while the pupil was dilated and eccentric, being drawn downwards and outwards towards 5 o'clock. The iris was grey, and its normal pattern was somewhat obscured. In addition there was a striking irregular dark brown pigmentation forming two bands at 11 o'clock and extending round the iris to a larger patch at 5 o'clock. (When the pigmentation was remarked upon, the patient said that he had noticed the development of a brown spot on the nasal side of the iris during the last 12 months). With the loupe, a deposit of fine pigment could be seen on the posterior surface of the cornea. The fundus was barely visible, but the disc appeared cupped. The right eye was normal in all respects, with a full field and vision 6/6. The iris was grey and had no extraneous deposits of pigment. A ring sarcoma of the uveal tract was diagnosed and the left eye was excised on February 25, 1930.

Macroscopic appearance.—On vertical section of the eyeball, a fine ring of dark pigment could be seen surrounding the anterior chamber in the region of the angle and coming forward on to the

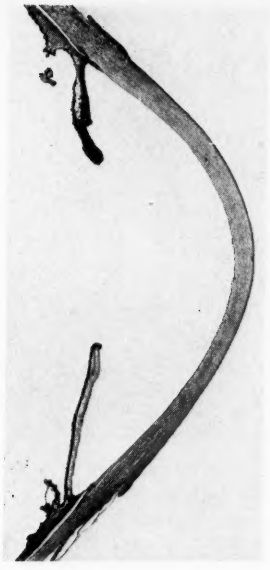

FIG. 1.

General view of growth showing invasion of angle on both sides. (× 12). Celloidin section.

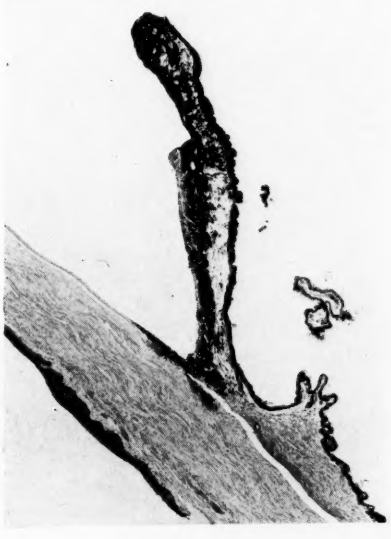

FIG. 2.

Showing extent of growth. (× 42). Celloidin section.

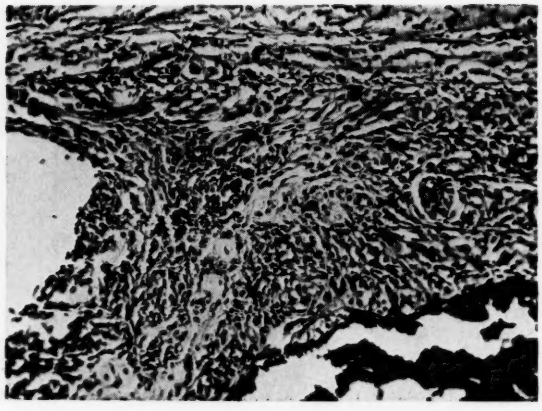

FIG. 3.

High power view showing distribution and cellular structure of growth (× 250). The anterior chamber is on the left side. Unbleached paraffin section stained haematoxylin and van Gieson.

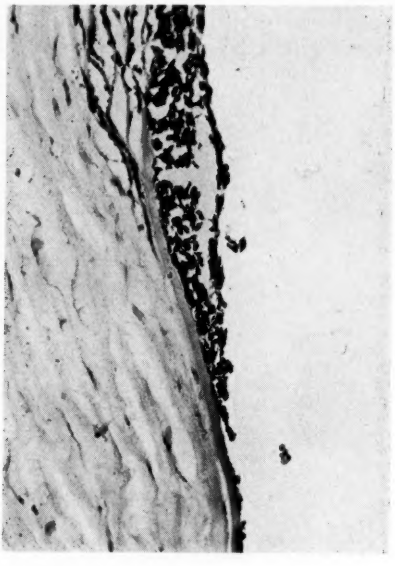

FIG. 4.

Extension of growth on both sides of Descemet's membrane. On the right the cells are continuous with the posterior endothelium. (× 330)

lower part of the cornea. The iris was thickened more especially in the region of its greatest eccentricity. The disc was cupped and the retinal vessels were engorged.

Microscopic appearance.—Both paraffin and celloidin sections were prepared, some being bleached.

On low power examination (see Fig. 1), a diffuse pigmented growth could be seen in the region of the filtration angle, invading the iris, the neighbouring sclera and the anterior part of the ciliary body. In every section which was examined there was involvement of the angle on both sides, thus indicating that the growth had a ring distribution. In agreement with the clinical appearance, the growth in certain places formed a flat mass replacing the anterior layers of the iris.

Under the high power, the growth was seen to consist chiefly of small spindle cells which could be seen particularly well on its free surface running parallel to the plane of the iris. (See Fig. 2). The cells were continued as a thin layer round the angle on to the back of the cornea where they were continuous with the posterior endothelium. Descemet's membrane was intact (see Fig. 4), but there was a slight invasion of the periphery of the cornea anterior to it. Outside the iris the growth was less compact, and in the filtration angle the cells formed small whorls and were separated by round spaces. (See Fig. 3). Schlemm's canal and the neighbouring vessels were surrounded by cells but were not actually invaded by them. The growth extended in a diffuse manner as far as the root of the ciliary processes.

The pigment was in excess of the actual growth, and formed large extracellular deposits while fine intracellular deposits could also be seen. The nuclei of the spindle cells were large in comparison with the size of cells. No mitotic figures were seen.

The growth seems to belong to the comparatively rare type of " ring " sarcoma of the iris, cases of which have been described by Solomon (1882), Meyerhof (1902), Parsons (1903), Alt (1911), Levan (1915), Pindikowski (1915), Li (1923), and Mayou (1930). Its special interest lies in the fact that it gave rise to symptoms of glaucoma, at such an early stage in its pathological development. In comparison, the growth had formed a definite tumour in each of the cases described previously.

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AN UNUSUAL COMPLICATION OF TRAUMATIC CATARACT

BY

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LONDON

A FOREIGN body entering an eye, without the patient being aware of it, is an accident that is not uncommon.

In the case reported here a piece of steel was present in the lens unsuspected by the patient; but an additional feature of considerable interest is the fact that the lens matter, which had become opaque as a result of the injury, suddenly became extruded into the vitreous.

History.—A man, aged 44 years, came to the Royal Eye Hospital complaining that he had noticed the sight of the right eye misty for three weeks. There was no recollection of any accident or injury to the eye.

Examination. Right eye.—Vision was reduced to hand movements, projection good, pupil reactions and tension normal.

The cornea and iris were normal, but the anterior chamber was rather shallow. No clear red reflex could be obtained, owing to extensive lens opacities irregularly distributed, but most dense towards the centre. Lying embedded in the substance of the lens, towards the temporal side, could be seen a glistening foreign body metallic in nature.

The shallowness of the anterior chamber was due to swelling of the lens. The eye was white with no suggestion of irritation, or any precipitate on the cornea.

Left eye.—Vision was full and the eye normal in every respect.

Operative interference was deemed inadvisable at this stage. It was thought better to wait until the lens should become completely opaque, and then remove the lens and with it the foreign body. The man was therefore kept under observation as an out-patient.

Subsequent history.—Seen a week later, the lens was much more opaque and swollen, and, in consequence, the anterior chamber more shallow, but the eye was not irritable.

A week later still the lens was almost completely opaque, the anterior chamber still more shallow, and the tension distinctly raised. A preliminary iridectomy was decided upon and done seven days later. Neither the operation nor the convalescence presented any unusual feature. The patient was seen once a week for the subsequent three weeks, and on every occasion the eye was white and quiet, and by then the lens was ready for extraction.

Just a month after the operation the patient presented himself because of a sudden sharp pain he had experienced in the right eye four days before.

Examination revealed a deep anterior chamber, with slight rise of tension and the opaque lens could be seen lying in the vitreous chamber below and behind the pupil. It was, therefore, necessary to attempt to remove it with the foreign body.

Operation.—The operation was carried out three days later, that is seven days after the experience of pain reported by the patient.

As the vitreous would in all probability present in the wound it was thought advisable to have a conjunctival flap prepared to cover the wound completely at the end of the operation. This was done by picking up a fold of conjunctiva at " 10.30 o'clock " 1 cm. from the limbus, carrying the incision radially to the limbus and then detaching the conjunctiva from the cornea all the way round above to " 3 o'clock." Above this incision a flap of conjunctiva was raised up so that it could be drawn down over the area of the incision and fixed by one stitch from the point of this flap to the ocular conjunctiva on the lower and temporal part of the eye.

The stitch was then inserted to be tightened when the operation was complete. The ordinary cataract section was then made. No vitreous presented. A vectis was introduced but before it could enter the vitreous cavity a definite resistance had to be overcome, due probably to the intact anterior capsule of the lens.

The lens was considerably broken up and the foreign body was removed with the largest mass of lens matter, several smaller parts having to be removed afterwards. Practically all the lens matter was removed with little loss of vitreous.

The stitch was then tightened bringing the conjunctival flap over the wound.

The foreign body proved to be a bit of steel 2 mm. in length and weighing 7 mgrs. The eye is progressing favourably.

Comments.—The lens matter, apparently, escaped into the vitreous by bursting through the posterior capsule, the anterior capsule remaining in its place and offering resistance to the vectis.

It is impossible to say how long the foreign body had been in the lens, but owing to the rapidity with which the lens swelled up after it was first seen it cannot have been long before the mistiness of sight was first noticed. Whether the swollen lens burst through an intact posterior capsule or enlarged a pre-existing wound is difficult to decide, but the absence of evidence of the steel having entered through the cornea lends support to the view that the foreign body entered the lens through the posterior capsule. In any case this complication of opaque and swollen lens matter becoming extruded into the vitreous is worth bearing in mind in cases of traumatic cataract in which the lens shows rapid swelling. In such cases a waiting policy would appear not to be devoid of danger.

NOTES ON B. WELCHII INFECTION OF THE GLOBE

BY

J. BRUCE HAMILTON

LONDON

IN view of the interest aroused by two recently reported cases of B. Welchii infection of the eye, the following is a report of two further cases.

Heath, in the November 1929 issue of this journal, dealt with a case of perforation of the globe with resulting pure B. Welchii infection, and he quoted from the literature. I was fortunate enough to see his case throughout, and intend after describing my own two cases, to offer, with Mr. Heath's kind permission, observations on the three cases I have seen.

Case 1.—On October 12, 1929, J. B., male, aged 16 years, was admitted to the Royal London Ophthalmic Hospital at 8 p.m. with a history of a piece of steel entering his right eye at 10 o'clock that morning. On examination the steel was seen lying in the vitreous to the nasal side of the disc and attached to the foreign body above was a large air bubble about twice the size of the foreign body itself and a little larger than the disc. At 9 p.m. the steel was removed from the globe by magnet through a keratome section in the cornea. Next morning at 10 o'clock there was some chemosis and a small hypopyon. Appropriate treatment was ordered, but by 9 p.m. the chemosis was protruding between the lids and the hypopyon almost filled the anterior chamber. Also the patient's face was flushed, his temperature 101° F., his pulse rapid, his skin warm and moist. At 9.30 the eye was eviscerated and the vitreous found to be full of pus. The patient's recovery was uneventful and he left hospital in 12 days.

A slope and stab culture of the vitreous pus was taken. The former grew Staph. Albus and the latter B. Welchii. Dr. S. H. Browning kindly did the bacteriological examination; he considered that, in view of the virulence of B. Welchii, the air bubble in the vitreous seen 10 hours after the entry of the foreign body was generated by that organism. That an air bubble of this size could remain in contact with the foreign body while it cut a track through the cornea, iris, lens and vitreous is quite impossible.

Case 2.—On May 2, 1930, H. D., aged 44 years, was chiselling wood in his own garden, when at 5.30 p.m. a piece of steel struck his left eye. During the night his eye became unbearably painful and when a colleague told me at 8 a.m. on May 3, 1930, that he wished to admit a male with an intra-ocular foreign body and that the man was in agony, I predicted that the infecting

organism would be B. Welchii. Shortly after 9 a.m. I made a routine examination and then found that his face was pale, his expression anxious, and his skin cold and moist.

Examination revealed:—

Right eye normal.

Left eye injected slightly; much conjunctival discharge; small perforation of the cornea down and out; much corneal haze; shallow anterior chamber; pupil one-third dilated; no hypopyon, gas or exudate in anterior chamber; no fundus reflex. Left vision —shadows. Defective projection.

At 10.30 he was seen by Mr. Foster Moore, when chemosis was present and some exudate had appeared in the anterior chamber; further, at that time the pain in his eye was so intense that morphia had to be administered. At noon the metallic foreign body was drawn into the anterior chamber by the Haab magnet, and on making a keratome section there escaped several bubbles of gas and some exudate with a fetid odour very closely resembling that smelt on opening an acute abdomen.

The foreign body was removed by hand magnet and the anterior chamber washed out with saline. The patient was returned to the ward and 50 c.c. of anti-gas gangrene serum was given intramuscularly. By 3 p.m. there was much exudate in the anterior chamber again and at 4 p.m., *i.e.*, 22½ hours after the injury—the eye was eviscerated under general anaesthesia and a pure culture of B. Welchii was obtained from the vitreous. The patient made an uneventful recovery and left hospital on the 10th day. On only one occasion was his temperature above 99° F., and that on the 4th day when it rose to 99·8° F.

Notes on:—

Aetiology.—In the great war it was found that gas gangrene followed two types of wounds:—

(1) Deeply perforating with a small point of entrance and retention of the projectile.

(2) Extensive wounds with widespread tissue destruction.

To the former type perforating injuries of the eye with retained foreign body exactly correspond and such a wound produces a suitable anaerobic medium. Further, it was found that all cases were earth contaminated, as these three cases also were.

Signs, symptoms and diagnosis.—From the three cases observed by me it appears that B. Welchii infection of the eye may be divided into two groups:—

(*a*) A mixed infection of B. Welchii and some pus-forming organism to which my first case belongs.

(*b*) Pure infection of B. Welchii to which Heath's and my second case belong.

Each group has such definite features that I think their salient points may be best illustrated in tabular form :—

	GROUP (*a*)	GROUP (*b*)
Symptoms ...	1. Rapid onset	1. Very rapid onset
	2. Not much pain	2. Intense pain requiring morphia
General signs ...	1. Drowsy	1. Very restless
	2. Flushed face	2. Ashen complexion, and facies resembling that of acute abdominal crisis
	3. Warm, moist skin	3. Cold, moist skin
	4. Marked pyrexia	4. Little or no pyrexia
	5. Marked increase in pulse rate	5. Very slight increase in pulse rate
Local signs ...	1. Red eye	1. White or slightly injected
	2. Cornea bright	2. Marked corneal haze
	3. Hypopyon	3. Stringy exudate in anterior chamber

Briefly, the general appearance of (*a*) is that of an ordinary panophthalmitis, while the general appearance of (*b*) is that of an abdominal crisis.

Prognosis.—For life, it is remarkably good in both groups. This is in contradistinction to the war injuries, in which the outlook was so grave and death so rapid. It has been found that B. Welchii will proliferate much more rapidly if combined with an aerobe, for the latter extracts all the oxygen from the media and makes a perfect anaerobic medium for B. Welchii, but in case 1 there was a mixed infection and no serum was given, as an anaerobe was not suspected and yet the case did remarkably well.

Treatment.—Perhaps the favourable prognosis is due to the treatment. It was found in the late war before serum was administered as routine, that wide excision of infected tissue gave the best results. What more perfect excision of infected tissues can be imagined than a simple evisceration? But I would still advocate the administration of serum if it is available, as its potency was clearly shown on the battlefield, and later in London by Williams in his treatment of acute intestinal obstruction, the toxaemia of which he showed to be mainly due to B. Welchii.

Bacteriology.—Fortunately B. Welchii is not a strict anaerobe, and therefore its culture is a matter of ease. On each occasion all I had at my disposal were two blood agar slopes; on the first, I made a slope culture, and in the second a stab culture with a platinum loop, taking my material from the vitreous without contamination from the conjunctival sac. Heath in a similar manner was able to cultivate his anaerobe.

I wish to thank Mr. Juler and Mr. Foster Moore for their kind permission to report these cases, also Dr. S. H. Browning for the bacteriological examinations and Mr. Heath for permission to discuss his case in conjunction with my own.

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ON LOOKING FOR HOLES IN DETACHED RETINA

BY

J. BRUCE HAMILTON

LONDON

ONE evening after a colleague and I had spent much time searching for a possible hole in a detached retina and had failed, he uttered the following aphorism: "There is only one thing more tedious than looking for a hole oneself, and that is watching someone else looking for it."

It had been my fortune—good or bad—during the past eight months to search for holes in well over sixty detachments that have entered Moorfields Eye Hospital for ignipuncture, and as the detection of holes has apparently come to be an essential investigation in the art of the modern ophthalmic surgeon, I feel, after my experiences, that I might offer a little help and advice.

The finding of a hole is the *sine qua non* of Professor Gonin's operation of ignipuncture, and I believe that he and his assistants are prepared to spend an hour daily for many days engaged in the search. It is impossible for a busy British oculist to spend so

much of his time in the quest for a hole, and therefore the following may speed his labour:—

I divide my detachments into two classes:—

1. *Those in which I do not expect to find a hole.*

(*a*) First we must remember that a not uncommon cause of detachment is sarcoma of the choroid and therefore a neoplasm must always be kept in mind. I believe that several patients with sarcomas have been sent halfway across Europe for ignipuncture only to be returned with a polite note. I admit that in the first enthusiasm of hole searching one quite easily overlooks this fact.

(*b*) There are the inflammatory detachments which are shallow, have a pinkish complexion and have not the same tendency to white billows as myopic detachments have. The vessels look dark red rather than black, while sometimes exudate is to be seen on the surface.

2. *Those in which I expect to find a hole.*

This group includes the myopic and the traumatic detachments, or a combination of both. It is in these that much time must be expended in searching and in that search I want to offer a word of encouragement.

(*a*) *History.*—A careful history is often of much value in hole finding. Always ask in what part of the field the visual loss was first appreciated.

One patient—a male Jew—with a left temporal detachment, related that four days previously, while at a picnic, he thought he saw a foreign body on the left side of his nose halfway between the bridge and the tip. So certain was he that one was present that he asked a friend to remove it and was surprised to hear that no foreign body was to be found. The next day the vision in the eye commenced to fail. When he told me this history four days later I immediately looked at 2 o'clock in the periphery of the retina and there found the smallest hole I have ever seen. It was certainly no wider than a retinal artery and not more than $\frac{1}{3}$ mm. in length. Without this clear history I much doubt whether I should ever have found this hole.

(*b*) *Dilated pupil.*—So far I have never seen a hole behind the equator of the globe but I believe they do occur. Consequently, I find it essential for the pupil to be fully dilated and then it is quite possible either with the direct or indirect method of ophthalmoscopy to see as far forward as the ora serrata. Personally, I always use the direct method with a Lister-Morton electric ophthalmoscope, for I find some holes—as in the case of the Jew mentioned previously—too small to see without high magnification. I believe Professor Gonin uses the indirect method with a condensing lens of 16 dioptres.

(*c*) *Types of hole.*—There are three main groups:—

(1) Tears at the ora serrata which are often only detected by the contrast of their white folded posterior edge and the lesser white of the main detachment. This is their shape.

(2) Small round holes which appear as if they had been punched out by a ticket inspector. These are often associated with old choroiditis and are usually to be found about one to one and a half disc diameters from the ora serrata. I might conveniently mention here that the diameter of a normal optic disc is 1½ mm. and that we use, when measuring space on the retina, a disc diameter as our standard distance. Later we convert our measurement into millimetres.

(3) Horse-shoe rents which are usually found in cases with a traumatic history and vary tremendously in size. The largest hole I have seen was a horse-shoe one and it extended from 6 o'clock to 2 and back to 6 again.

(*d*) *Old choroiditis.*—When talking about type (2) holes I mentioned old choroiditis. I believe all searchers for holes have been struck by the presence of old peripheral choroiditis in eyes with detachments, and more especially by the fact that the holes in the detachments when found have been closely associated with or surrounded by pigment. If, therefore, one finds such a patch of old choroiditis, its vicinity should be diligently scrutinized and possibly much time will be saved.

(*e*) *Multiple holes.*—These are by no means uncommon and it is this fact which makes hole hunting so laborious. Unless every hole is detected it is far better that none is found, for it is useless to cauterise one hole when others remain undetected. Further, without doubt I have seen fresh holes appear after an operation—holes which were not present before the puncture was done. Therefore it is all-important that the retina be thoroughly explored before the operation, so that one can be sure that certain holes are secondary. These secondary holes usually appear as rents at the ora serrata.

(*f*) *Position of detachment.*—(1) *Above.* I have invariably found

that if the detachment is above, the hole is there also, but sometimes the hole lies behind a fold and cannot be seen with ease. In such a case the patient should be ordered three to four days in bed, when the detachment will probably change in size and possibly in position so that the hole or holes are seen with ease.

(2) *Lateral and medial.*—If the detachment is localised to a medial or lateral position then one can be fairly sure that the hole is on that side, and usually in the upper third of the detachment.

(3) *Below.*—As most detachments usually settle to this position it is difficult to say, when it is seen for the first time and is below, where the hole will be found. It may quite possibly be in the detachment itself, but often I find them quite apart in a portion of the retina which appears to be completely in position.

Failure.—If at first one fails to detect a hole, then as I have said before, the patient should be put to bed for three to four days and another attempt made. Change in body position for a short time often means change in detachment position. Sometimes a hole lies behind a fold or billow, and by rest is brought into view. But I do not advocate a posterior sclerotomy with the intention of altering the shape of the detachment, for the risk of making an artificial hole in the retina is a real one.

Fallacies.—(*a*) *Atrophy of the retina.* Sometimes the retina which is detached appears so atrophic in patches that the unwary may mistake such patches for holes. Personally, I feel that these patches are so atrophic that fluid from the vitreous can penetrate through them and therefore they are potential holes. But this is only my own opinion.

(*b*) *A cleft below.*—It is usual when the detachment lies below that it is divided into two symmetrical portions by a deep cleft in the mid-line of the eye. I have discussed this cleft with Miss Mann and she feels that it may be due either to pressure of the hyaloid canal or else to the firmer attachment of the retina to the choroid at the site of the foetal cleft. Whatever be the theory of the origin of this cleft, the fact is that as it looks red and the billowy retina on each side looks white it may be mistaken for a hole.

(*c*) *Aphakic eyes.*—And now a last word on aphakic eyes with detached retinae. These detachments usually occur some thirty to forty years after needling for lamellar cataract, and I think that finding holes in them is quite a superhuman feat, but it is not totally impossible, for in one I was able to see no less than three holes, but I must admit that they were found before I saw the case.

OXFORD OPHTHALMOLOGICAL CONGRESS

XXth ANNUAL MEETING

THE XXth Annual Meeting of the Oxford Ophthalmological Congress was held at Oxford on July 10, 11, and 12.

Members met informally at dinner on the 9th, in the Hall of Keble College, which had again offered its hospitality as in former years. The advantage which is gained by the all too short stay in the College, where each member is assigned rooms and becomes for the time being an undergraduate again, is quite one of the features of this successful annual gathering of ophthalmic surgeons, which was founded by the late Robert Doyne in 1909. The proceedings of the Congress were held in the Department of Human Anatomy of the University, kindly lent for the purpose by Professor Arthur Thomson, to whom the Congress is under a deep debt of gratitude. In addition to the Scientific Museums, a Commercial Exhibition was on view, in which numerous well-known firms of ophthalmic instrument makers displayed the latest forms of apparatus and instruments used in the speciality.

An unusually large number of foreign members and others resident abroad attended the Congress this year. Amongst these were Prof. Gonin, of Lausanne, Prof. Schüller, of Vienna, Dr. Harry Friedenwald, of Baltimore, Prof. Curran, of Kansas City, Dr. Bernard Samuels and Dr. Tyson, of New York, Dr. Derrick T. Vail, Jr., of Cincinnati, Dr. van Heuven, of Utrecht, and Dr. Andrè Patry, of Geneva.

The proceedings opened on Thursday, July 10, with a short address of welcome by the Master of the Congress, Mr. A. BERNARD CRIDLAND. Immediately following this, Dr. TRAQUAIR introduced, from the ophthalmological standpoint, a symposium on toxic amblyopia including retrobulbar neuritis. He was followed by Sir FARQUHAR BUZZARD, who discussed the matter from the point of view of the physician, and Prof. J. A. GUNN amplified the subject from the pharmacological aspect. Dr. TRAQUAIR in his remarks said that to the clinical ophthalmologist retrobulbar neuritis presented itself as a visual defect in the form of a central, or paracentral, scotoma not explained by visible ophthalmoscopic changes in the macular region. He spoke of the rapid onset and gradual recovery which is often complete, the defect varying from slight visual loss to complete blindness. The characters of the scotoma were predominant involvement of the area of the crossed fibres, and the importance of the detection of quadrantic or hemianopic features was shown. He said that the appearance of the optic disc may vary from normal to that of choked disc, or there may be pallor.

The clinical picture varies considerably, irrespective of the different causes, but certain forms show features which are to some extent distinctive. In retrobulbar neuritis with myelitis the visual defect is bilateral and may exhibit quadrantic features indicating a chiasmal site. There is also gross swelling of the optic discs. The scotoma in Leber's disease is bilateral with a less pronounced tendency to recovery. In acute retrobulbar neuritis, the defect is unilateral, and the tendency to recovery very pronounced. The pathological basis of the disease is the formation of plaques in the optic nerve which have a special inclination to affect the papillo-macular fibres. As regards causation, retrobulbar neuritis may be regarded as a manifestation of disease elsewhere, rather than as a primary disease of the optic nerve, thus the cause is to be sought elsewhere in the body. Differences of opinion exist as to the relative importance of certain causes, such as multiple sclerosis and paranasal sinusitis, dental and tonsillar infections. The true cause may not be manifest for a long time. The diagnosis of the cause is based on the study of the eye symptoms and on general physical examination, together with that of the visual fields and the detection of quadrantic or hemianopic features in the scotoma. Radiograms are very useful and the danger of neglect of eye symptoms in favour of the search for a septic focus is to be deprecated. Prognosis is good in the acute form, and usually favourable in others; complete blindness, even of one eye, is a rare result.

The expression toxic amblyopia refers to partial blindness due to toxins in the circulation, but no distinct boundary exists between toxic amblyopia and retrobulbar neuritis; the pathological lesion has been found by Roenne to be the same in both. In tobacco amblyopia for example, blindness is never produced, and the influence of the physical condition of the patient should always be borne in mind. In quinine amblyopia, the visual defect is due to direct toxic action on the nerve elements, rather than to retinal ischaemia.

Sir FARQUHAR BUZZARD, in discussing the question from the point of view of the physician, quoted from a passage in a paper written by his father in the last century, emphasizing the importance of these ocular symptoms in certain nervous diseases.

He discussed the clinical aspects of these conditions from a neurological and general medical viewpoint.

Prof. GUNN dwelt on the pharmacological considerations in these diseases and suggested a much closer co-operation between the pharmacologist and the ophthalmic surgeon, in fact the laboratory worker and the clinician should work hand-in-hand. The subject of quinine amblyopia was also commented upon.

The discussion was continued by Dr. LEIGHTON DAVIES,

especially with regard to contraction of the visual fields in certain conditions; Mr. Gray Clegg, Mr. Adams, Drs. Rosa Ford, and Andrè Patry, Mr. Montague Harston, Prof. Schüller, Messrs. Joseph, Browning, Harrison Butler, Greene, Cyril Walker, Young, Giri, Galloway, Haycraft, and Drs. Tyson, Primrose and Thakore.

Dr. BERNARD SAMUELS read a paper on opacities in the vitreous, and showed some beautiful drawings of opacities in this medium and fully described their appearances and general character.

In the afternoon, Sir OLIVER LODGE, F.R.S., gave a most interesting and lucid address entitled "Modern Theories on the Nature of Light," which was attentively followed by the large audience. He prefaced his remarks by saying he did not know how much his hearers knew, and trusted the address would not be too elementary! Which humorous quip appealed to those present. He first of all gave a short sketch of the corpuscular and wave theories, and the reasons why the wave theory must be true. He then proceeded to show reasons why the corpuscular theory must also be true. Modern attempts at the unification of these two theories were then fully described, together with a theory of the probable nature of vision. The interaction of matter and radiation were fully dealt with, and its consequences were described. At the conclusion a vote of thanks was proposed by Mr. LESLIE PATON, President of the Ophthalmological Society of the United Kingdom, and seconded by Mr. CYRIL WALKER. It was carried with acclamation.

In the Scientific Museum, Mr. BURDON COOPER showed the orthogon test, Mr. ARTHUR GREENE, a specimen of ciliary growth causing glaucoma, Dr. TRAQUAIR, a model of a field of vision, and Mr. ALABASTER, a stereoscope, useful in fusion training. Mr. TUDOR THOMAS gave a demonstration of live rabbits with transparent corneal grafts. Mr. ERNEST MADDOX showed a hand attachment for the wing test, together with a stereoscope.

In the afternoon, tea was provided for members and their friends at Worcester College, where they were received by the PROVOST, Mrs. LYS, and Mrs. BERNARD CRIDLAND.

In the evening the Annual Dinner of the Congress was held in the Hall of Keble College, under the Presidency of the MASTER. Among the guests present were Laura Lady Airedale, Sir Farquhar Buzzard, Prof. and Mrs. Schüller, Prof. Gonin, and Dr. Evans. The dinner was the largest ever held in connection with the Congress, 142 members and their guests being present. The Master in the course of his speech stated it was the 21st year of their history, although only the 20th meeting, as in 1926, there was no Congress on account of the English Speaking Ophthalmological Congress, which was held in London that year. He

read a letter from the American Ambassador, regretting that absence abroad made it impossible for him to be present. A letter from the President of the Roentgenological Society of Vienna was also read congratulating the Congress on being the first of that speciality to place radiographic diagnosis in the forefront of their programme. Mr. CYRIL WALKER proposed the toast of the guests, and Prof. Schüller replied. At the conclusion of the speeches, Mr. GRAY CLEGG presented Mr. CRIDLAND on behalf of the members of the Congress with a gold watch and a set of table silver as a memento of his yeoman work for 14 years as Secretary of the Congress, and Mr. GREENE, in addition, presented the MASTER and COUNCIL with a badge of office to be worn by the Master on future official occasions. He stated that subscriptions had come in from all over the world for this testimonial, which showed how much Mr. Cridland's strenuous work during so many years had been appreciated. Mr. Cridland, who was obviously much affected by this recognition of his work, replied in a charming little speech of thanks.

The design of the official badge, which is of silver gilt, has at the upper part an eye, and the lower two-thirds show the colours of the spectrum in radiating beams on which are the leaves of belladonna, cocaine and calabar bean.

On Friday morning an address was given by Prof. SCHULLER, of Vienna, on recent developments in radiology associated with ophthalmology. He first described in much detail the normal variations of the sphenoid and then passed on to a description of the inflammatory conditions and neoplasms of its sinus. Infiltrating processes were then discussed, and destruction of the bone due to intracranial tumours. Sinuscele of the sphenoid was then illustrated and deformities found in neurofibromatosis were described. Prof. Schüller, who spoke for an hour in faultless English without notes, was listened to with wrapt attention, and on his conclusion was accorded an ovation by his large audience. The paper was discussed by Dr. BOWIE, Mr. EDMUND JONES, Dr. TRAQUAIR, and Mr. FOSTER MOORE.

The Doyne Memorial Lecture was given by Dr. HARRY FRIEDENWALD, of Baltimore, on pathological changes in the retinal blood vessels in arteriosclerosis and hypertension. The lecturer minutely described the eye changes found in these conditions, illustrating them with a number of lantern slides. It is impossible to abstract this address, which should be read in the original. Mr. P. ADAMS, the Deputy Master, and Dr. TRAQUAIR proposed and seconded a vote of thanks to the lecturer.

On Friday afternoon, an address was given by Prof. JULES GONIN, of Lausanne, on detachment of the retina and its treatment. He described how he recognized the truth of Leber's

theory, that acute detachment was due to vitreous fluid passing through a retinal tear into the subretinal space and how he was led by further researches to complete that theory and to extend it to all so-called spontaneous or myopic detachments. In all these forms, the tear being the determining cause of the detachment and hindering it from healing, the most certain way to a definite cure was by scarring up the hole by means of a thermo-cautery when possible. In all recent cases, when the hole has been closed cure is immediate and permanent, and a relapse of the detachment shows that the tear has not been sealed. If the retinal tears are large or multiple treatment takes a long time or may be impossible. The author illustrated by means of drawings, his procedure for localizing the retinal tear and the method of operating, also the ophthalmoscopic appearances of the detached retina before and after the thermopuncture. The following members joined in the discussion, Messrs. ORMOND, GOULDEN, JULER, HAY, RIDLEY, Sir WILLIAM LISTER, Messrs. HAYCRAFT, GRAY CLEGG, GIRI, HARRISON BUTLER, and LINDSAY REA.

On Saturday morning, Mr. HARRISON BUTLER read a paper on keratoconus posterior, a hitherto undescribed condition discovered by the aid of the slit-lamp. This was discussed by Dr. MARION GILCHRIST, Miss MANN, Dr. TRAQUAIR, and Mr. GRAY CLEGG.

Dr. TRAQUAIR read notes on new instruments and technique in cataract extraction; the paper was discussed by Mr. GRAY CLEGG, Dr. DERRICK VAIL, Jr., and Messrs. GREENE, CHAVASSE, STEWART, CURRAN, and GIRI.

Dr. DE COURCY read a paper on interstitial keratitis in workmen's compensation cases. This interesting medico-legal paper attracted much attention and was discussed by Messrs. HARRISON BUTLER, BICKERTON, YOUNG, JACQUES, PRIMROSE, KENDALL, HAY, ALABASTER, and the MASTER.

Dr. VAN HEUVEN, of Utrecht, read a short paper on recurrent chronic uveitis, which was illustrated by many excellent lantern slides, and was discussed by Dr. CHAVASSE.

The proceedings closed on Saturday, July 12, at mid-day, and it was the unanimous opinion that it was the most successful meeting ever held in the history of the Congress. Indeed, the number of members present, namely, 149, greatly exceeded any previous record of the Congress and severely taxed the capacity of the University Anatomy Theatre and the executive staff of the Congress.

G. C. RUSS WOOD.

ABSTRACTS

I.—GLAUCOMA

(1) **Bell, George Huston (New York).—Iridotasis for primary and secondary glaucoma.** *Arch. of Ophthal.*, February, 1930.

(1) **Huston Bell** has used this operation in 40 cases of glaucoma with the following results.

	Good	Poor
Acute inflammatory type	6	4
Chronic type	10	0
Absolute type	10	0
Secondary type	9	1

He has not used it in buphthalmos. In his opinion the operation of choice for acute glaucoma is iridectomy, but in the chronic types iridotasis is to be preferred because there is so little trauma to the eye. He has had no late infections and attributes his immunity to the continued use of boric and zinc lotion (gr. 2 to the ounce) after operation. The technique is to dissect up a flap of conjunctiva as for trephining and to pass a narrow keratome into the anterior chamber from a point 1—2 mm. behind the limbus. The incision should not be more than 4 mm. long. Fine forceps is then introduced, made to grasp the iris near the pupillary margin and draw it out into the wound so that the posterior surface is in contact with the anterior lip of the wound. The conjunctival flap is kept in place with three sutures and gentle daily massage is instituted from 24—48 hours after operation.

F. A. W-N.

(2) **Gifford, S. R. (Chicago).—The pathogenesis of glaucoma.** *Arch. of Ophthal.*, January, 1930.

(2) **Gifford's** article consists in a critical survey of present theories of the pathogenesis of glaucoma. Seidel and his school consider that most cases are due to a blocking of the drainage channels for the aqueous, chiefly at the angle of the chamber. They are of opinion that this fluid is formed by secretory activity of the ciliary epithelium because; (i) Granules and vacuoles characteristic of secretory activity can be demonstrated in the cells. (ii) Pilocarpine stimulates the activity of the epithelium; this can be shown by dropping 2% fluorescein on the conjunctival bleb left after trephining, when it is found to clear more quickly after instillation of pilocarpine and less quickly after atropine. (iii) There are characteristic appearances after vital staining. (iv) Injection of toxic substances such as potassium cyanide into the vitreous lowers the intra-ocular pressure, apparently by reducing

ciliary secretion. (v) The pressure in the intra-ocular capillaries, according to their findings, is 30 mm. Hg which, allowing for the intra-ocular pressure of 25 mm. Hg and the osmotic pressure of the blood, is insufficient to allow fluid to enter the eye without the intervention of a true secretory process.

With regard to drainage, Seidel found, in patients with a shallow anterior chamber, a marked increase in tension after a stay in a dark room. In one case the rise was from 20 to 80 mm. Hg. Also the weight of the tonometer caused five times as great a fall of tension in patients with small pupils as it did in those having large ones. Finally if coloured fluid be injected into the anterior chamber, and the pressure be raised slightly above the intra-ocular pressure, the anterior ciliary veins can be seen to fill with fluid. These observations led Seidel to conclude that glaucoma is due either to hypersecretion of aqueous or insufficient drainage at the chamber angle. Hamburger believes that the disease is due essentially to a relaxation of the vaso-constrictor mechanism of the eye, affecting principally the choroid. His opinion is based on the curative effect of adrenalin and the association of glaucoma with vascular naevi and with emotional stress. Magitot and Bailliart think that the cause is obstruction in the choroidal veins because (1) Experimental obstruction of the vortex and anterior ciliary veins produces hypertony. (2) Compression of the carotid artery produces hypotony. (3) Pathological examination of early cases of glaucoma shows in almost all cases periphlebitis or sclerosis of the choroidal vessels, and this is so even in the eyes of buphthalmic infants. (4) Certain pathological conditions such as orbital cellulitis and pulsating exophthalmos interfere with the venous return from the eye and have been reported as causing secondary glaucoma. Duke-Elder's views are not so dogmatic. He considers that the aqueous is a dialysate because he found sufficient difference in pressure between the blood in the retinal arteries and the general contents of the eye to allow of fluid leaving the former against the osmotic attraction of the blood colloids. On the other hand the venous pressure in the eye is 39 mm. Hg so that the only way in which circulation of aqueous can take place, is by intermittent increases in intra-ocular pressure forcing fluid out of the canal of Schlemm. Since physostigmine causes increased formation of aqueous even after removal of the ciliary ganglion, the increase of fluid cannot be due to secretory activity but is caused by the vaso-dilatation brought about by use of the drug. Duke-Elder does not, therefore, believe that obstruction of the chamber angle is the only cause of glaucoma and thinks that it may be secondary to other changes in the vitreous, vasomotor system, etc.

Various authors have reported diminution in the osmotic pressure of the blood in glaucoma but this is due only to diminished

content of crystalloids, and so could have no effect on the formation of aqueous. Others have found abnormalities in the vasomotor control of patients suffering from glaucoma, especially in the regulation of the capillaries, and there are frequently other signs of vaso-neurosis, such as asthma, urticaria and teichopsia. According to these observers glaucoma is due to increased permeability of the capillaries. Against this theory, however, is the observation that choline reduces the intra-ocular tension although it brings about vasodilatation. The observation of decreased tension after cocainisation or alcohol injection of the sphenopalatine ganglion shows that there is a nervous element in the production of this disease. Malling is of the opinion that quiet iridocyclitis may be the primary cause of all cases of glaucoma, because out of 71 patients with this disease, there were only nine who showed no evidence of iridocyclitis when examined with the slit-lamp. The present position with regard to the vitreous would seem to be as follows:—Its iso-electric point is pH 4·2, a reaction much more acid than ever occurs in the body fluids. The vitreous, therefore, is never at its minimum volume though in the extreme acidosis accompanying diabetic coma, it shrinks considerably, so that the eye becomes soft. Redslob and Reiss have found that by increasing the alkalinity of the vitreous from the normal pH 7·7, to pH 8·2, a definite amount of swelling followed each change of 0.1.pH. Since the addition of 0·22 c.c. of fluid to the human eye at normal tension raised it to 60 mm. Hg, it is quite possible that changes in tissue alkalinity occurring during life may cause enough swelling of the vitreous to result in glaucoma.

F. A. W-N.

(3) **Krause, K. (Berlin).—Vascular naevi and glaucoma. (Naevus flammeus und Glaukom).** *Zeitschr. f. Augenheilk.*, Vol. LXVIII, p. 244, 1929.

(3) **Krause** reports two cases of his own and reviews the twenty-seven cases recorded in the literature on the subject of the association of naevi with glaucoma. Of the twenty-seven cases recorded, eleven were cases of glaucoma supervening in late life in people with naevi, and in the remaining sixteen cases buphthalmos was present from birth in patients suffering from this vascular disfigurement.

Of Krause's cases one was a glaucoma which began to develop at the age of fifteen in the right eye of a patient who had an extensive port-wine stain affecting mainly the right side of the face. The other was a case of a boy aged two years suffering from unilateral congenital buphthalmos and a port-wine naevus on the corresponding side of the face. In the first case there were also seen teleangiectatic changes in the conjunctiva, iris and choroid.

In this case compression of the jugular veins led to a slight increase in the tension of the eye, and to a dilatation of the vessels of the iris and choroid; on the other hand compression of the carotid artery on the side of the affected eye together with massage of the globe led to some lowering of the tension. In the second case, that of the baby with buphthalmos, there were present painful spasmodic contractions of the limbs on the side of the affected eye, probably due to cerebral haemangioma and the presence of an enlarged liver led to the possible diagnosis of haemangioma of the liver.

The author associates himself with the view expressed by earlier observers that these cases of glaucoma are the result of teleangiectasis of the choroid. But it must be added that Safar, who had the opportunity of examining microscopically a buphthalmic eye which had the association discussed here, could find no abnormality other than an imperfectly formed canal of Schlemm, and even this abnormality was not found by Clausen who reported on the second examination on record.

ARNOLD SORSBY.

(4) **Mukerjee, S. K. (Calcutta).—Glaucoma as a result of epidemic dropsy.** *Calcutta Medical Journal*, March, 1929.

(4) In the course of a severe outbreak of epidemic dropsy or beri-beri in Calcutta, **Mukerjee** saw 253 cases of glaucoma complicating the disease. In most cases the glaucoma came on during the convalescent stage or during the course of the milder but prolonged attacks. Most of the patients were constipated, those with looseness of the bowels generally escaping the ocular complication. Not only hypermetropic or small eyes were involved but normal and myopic eyes also. An analysis showed 90% to have occurred among rice-eaters and the commonest age period to be 20 to 40 years. The attacks appeared to conform to the classical type of subacute glaucoma with the following departures from type:—(i) the anterior chamber was normal or deep; (ii) the pupil was normal or only moderately dilated; (iii) the cupping of the optic disc was little more than physiological but was progressive. In three cases arterial pulsation on the optic disc was seen. No definite signs of iridocyclitis were present.

The fields of vision showed nasal contraction as a constant feature with the loss of some part of the central field in many cases.

The tension was found to average 70—100 mm. of Hg by McLean's tonometer, often varying during a day, even to the extent of becoming normal.

Blood and urine examinations helped little in elucidating the cases and the suggested cause was a hyper-secretion by the ciliary body as a result of passive congestion induced by the causative factor in epidemic dropsy. If this be a toxin which might damage

the vessel walls, thus increasing transudation from ciliary capillaries, it would seem that the diarrhoeic cases escape glaucoma because the toxins are profusely eliminated through the intestinal canal.

Treatment was directed against the general condition, especially with a view to the elimination of any toxins, and locally to the eyes. In the majority, the glaucoma was cured by the free use of miotics but where raised tension persisted or the field of vision steadily decreased operation was undertaken. Trephining was done in 57 cases, simple iridectomy in two. The results were very satisfactory, only five or six failing as the result of very high tension or almost complete loss of vision. Cataract developed after operation in two cases but for this type of glaucoma the operation of trephining is strongly supported.

R. C. DAVENPORT.

(5) **Kronfeld, P. C. (Vienna and Chicago).—The intra-ocular pressure following puncture of the anterior chamber in glaucoma. (Das Verhalten des intraokularen Druckes nach Vorderkammerpunktion bei Glaukom).** *Zeitschr. f. Augenheilk.*, Vol. LXXI, p. 48, 1930.

(5) As a result of careful tonometric studies in 74 glaucomatous eyes in which puncture of the anterior chamber was performed—as a sequel to an earlier study of the effect of the same procedure on normal eyes—**Kronfeld** comes to the following conclusions:—

1. In glaucoma with increased tension, intra-ocular pressure becomes re-established more quickly than in normal eyes. Once the original pressure is reached, a phase of reaction with still further increase of tension sets in, followed by a slight decline in tension for a short period. This is also true for glaucoma with normal tension, *i.e.*, glaucoma in which optic atrophy of the glaucomatous type rather than increase in tension is the dominant feature.

2. The rapid restoration of tension after puncture of the anterior chamber may be taken as a characteristic and diagnostic feature of glaucoma.

3. The rapidity with which intra-ocular pressure rises from 0 to 15 mm. mercury may be considered as an indication of the sum of the active factors concerned in the restoration of tension (such as vasomotor reaction, changes in the production and in the albumen content of the aqueous. These factors are therefore in a state of heightened activity in glaucoma.

4. From a study of cases of buphthalmos and of secondary glaucoma due to cyclitis the author concludes that the first of these conditions is a " pure retention-glaucoma," and the second is due to retention with inflammatory hyperaemia of the uvea.

ARNOLD SORSBY.

(6) **Vogt.—New cases of capsular glaucoma. (Neue Fälle von Linsenkapselglaukom).** *Klin. Monatsbl. f. Augenheilk.*, Bd. LXXXIV, S. 1, 1930.

(6) **Vogt** finds that out of 150 cases of chronic glaucoma 8·6 per cent. were of a type hitherto undescribed, apparently being due to an exfoliation of the anterior capsule of the lens. This exfoliation appears to be a senile phenomenon, when a fine membrane, which is probably detached by the movements of the pupil, is seen lying over the pupillary border. Out of all the cases of an exfoliation of the capsule of this nature which were observed, chronic glaucoma followed in 75 per cent., because, in Vogt's opinion, there was a mechanical blockage of the filtration channels by detritus. The prognosis after operation in this type of chronic glaucoma is less good than in other types.

W. S. DUKE-ELDER.

(7) **Farina.—Increased intra-ocular pressure and true glaucoma. (Ipertonie endoculari e glaucoma vero e propio. Studio ezio-patogenetico e clinico-terapeutico in base alla dottrina neuro-endocrinologica.)** *Arch. di Ottal.*, November, 1929.

(7) **Farina** recalls the well-known fact that women are much more frequently the subjects of glaucoma than men, and concludes that in the production of high intra-ocular pressure there are concerned the genital glands and the thyroid, with the other endocrine glands as adjuvants.

When certain degenerative changes are present in the eye, attacks of high pressure occasioned by these glands, become primary glaucoma; when such changes are not present, the manifestations subside. He has succeeded in some instances in his attempt to lower the intra-ocular pressure by re-establishing the normal functions of the glands, or supplementing the missing hormones by administering glandular extracts.

HAROLD GRIMSDALE.

II.—CONJUNCTIVA

Tontscheff. — The treatment of spring catarrh with lactic acid. (Zur Behandlung des Frühjahrskatarrhs der Augen mit Milchsäure). *Klin. Monatsbl. f. Augenheilk.*, Bd. LXXXIII, S. 48, 1929.

Tontscheff reports extremely good results in the treatment of spring catarrh with lactic acid. This opinion is based on a series of 19 patients in which a perfect cure was obtained in 12—an

extremely high percentage in this recalcitrant disease. The technique which he uses is as follows:—

The conjunctival sac is anaesthetized with a 5 per cent. solution of cocaine and epinephrine. The upper lid is everted, a horn plate is inserted below it to protect the eye, and a 10 per cent. solution of lactic acid is applied by means of a probe tipped with cotton wool. After one or two minutes the surface of the conjunctiva is neutralized with saline or mercury oxycyanide. The same process is then repeated on the lower lid and on the conjunctiva bulbi, great care being taken to protect the cornea, since the application of the acid here gives rise to an opacity. If there are gross proliferations these should first be curetted if they are on the conjunctiva of the lids, and if they are on the bulbar conjunctiva they should be excised. The application of the lactic acid may require to be repeated in some instances, and should always be repeated if a curetting or excision of proliferations has been necessary. Solutions up to 40 per cent. of acid may be used; it is stated that these cause pain equivalent to that experienced after painting with 2 per cent. silver nitrate. After treatment, no bandage is required, itching of the lids and discharge cease in about three days. Discoloration of the conjunctiva does not follow and in one case where a drop of the concentrated solution of the acid accidentally fell upon the cornea, the opacity which resulted disappeared after a short time.

W. S. DUKE-ELDER.

III.—BIOCHEMISTRY

Redslob and Reiss (Strasbourg). — On experimental variations of the ocular tension in relationship with the physico-chemical properties of the vitreous. (Sur les variations expérimentales du tonus oculaire en relation avec les propriétés physico-chimiques du corps vitré). *Ann. d'Ocul.*, CLXV, p. 1, 1929.

Redslob and Reiss state that they have previously (*Ann. d'Ocul.*, 1928, p. 641) shown the dependence of the swelling of the vitreous in the eye of the cow upon its pH, and particularly its diminution on the acid side. Injections of 0·1 c.c. of fluid were possible into the rabbit's vitreous. With normal saline this caused a rise of tension (Schiötz) from 25 mm. Hg to 100 mm. or more, of short duration. In ten minutes, the tension dropped to 30 mm. Hg. Injections of isotonic solutions of HCl or H_3PO_4 resulted in a fall within thirty minutes to about 15 mm. Hg, and

in a few hours to 10 mm. Hg. In ten days, the tension started to rise and reached normal in about thirty days. Injection of alkaline solution (NaOH, n/6) into the rabbit's eye resulted in a persistent high tension for several hours instead of a fall as with normal saline. Experiments with injection of four different gelatine solutions gave similar results for the four solutions—a fall from the raised tension of injection to about normal in twenty-four hours and a subnormal tension up to the eighth day.

Conclusions.—The results of experiments on living rabbits agree with measurements of vitreous swelling in relation to pH obtained with the enucleated eye of the cow. Injections of acid lowered the tension for an average period of twenty days. Alkaline injections gave a temporary rise in tension followed by a fall. Injection of gelatine has a hypotensive action like acids.

A patient with absolute glaucoma in one eye—the other being healthy—in whom treatment by iridectomy and with the use of drops of pilocarpine, eserine, aminoglaucosan and finally anterior sclerotomy, was without effect, was given injections into the vitreous of the affected eye. Signs of acute glaucoma were present, with great pain, sleeplessness, tension 90 mm. Hg, and vision of light perception with bad projection. An injection of 0·2 c.c. of isotonic solution of H_3PO_4 was made under local anaesthesia. All treatment was stopped. The day after operation the patient said he had slept well, that all headache disappeared and that he felt much better. The eye was less red and the cornea now clear and bright. The vision was unaltered. The tension chart (reproduced) showed a marked improvement for several days.

HUMPHREY NEAME.

IV.—CORNEA

Pillat, Arnold (Pekin, China).—Does keratomalacia exist in adults? *Arch. of Ophthal.*, September-October, 1929.

Pillat's paper gives an affirmative reply to the question he uses as a heading. All conditions from simple epithelial xerosis to complete necrosis of the cornea may be seen in adults; and the author considers keratomalacia to be only one symptom of a disease affecting all the structures derived from ectoderm. He reports seven cases of varying severity. The first one, in a man aged 19 years, had night blindness, slight pyrexia, a dry white conjunctiva and a dry xerotic patch in the centre of the cornea of each eye. He had been living on a few vegetables, some white Chinese cabbage and very little else, although he was doing heavy

manual labour. His face was covered with comedones, and the skin was dry, puffy and ashy. He recovered completely by having a diet of butter, milk, liver, cod-liver oil, and lemon juice. The fourth case was interesting, because the condition might easily have been mistaken for an hypopyon ulcer. The whole left cornea was dull and dry with a dense ring of opacity about 1·5 mm. from the limbus and a centrally placed circular ulcer with undermined edges. Deep to this was an abscess in the substance of the cornea which was continuous with an hypopyon. The diagnosis could be made, however, by examination of the conjunctiva which showed dirty grey folds like argyrosis, in the fornices, while in the bulbar portion the membrane had become like dried up leather and was lying in folds concentric with the corneal margin. In spite of its advanced condition, the ulcer healed completely, after 10 days of dietetic treatment. Although this patient was only 18 years old, an opacity like typical arcus senilis remained permanently in the cornea. Case 5 was more severe; when first seen the eyes were so covered with dry yellow crusts that nothing was to be seen, either of the conjunctiva or cornea. When the crusts were removed there were seen, projecting from the palpebral fissure, irregular, purplish grey, leathery folds of conjunctiva. The right cornea showed a severe, perforating ulcer while in the left the destruction had extended to the limbus and at one point into the sclera. There were also important general symptoms. The patient was mentally confused and though only 45 years, appeared like a man of 60 years. His colour was a dark greyish brown. The skin was dry, earthy and desquamating, lying in wrinkles and deep folds and showed numerous areas of secondary infection, though there was little inflammatory reaction as the whole organisation was in a state of such intense exhaustion. Case 6 was even more severe and was of special interest because the multiple abscesses without inflammatory symptoms, were diagnosed in another department as syphilitic. They all healed under correct dietetic treatment.

In the second part of his paper Pillat comments on his cases and draws some general inferences from them. Conjunctivitis is not an essential symptom of the disease but is commonly present as a secondary infection, due to the lowered vitality of the patient. Severe cases may at times resemble trachoma, particularly as the dry state of the conjunctiva may be scanty and easily overlooked. The curious colour of this membrane, however, helps in the diagnosis. The lower fornix is at first yellow, then changes from light grey to a deep brownish grey, exactly resembling argyrosis, while the bulbar conjunctiva becomes yellow but not dark brown. In the cornea there are first of all xerotic spots which may turn into ulcers. Changes in the lens are not easily seen, because of

the corneal opacity, but in cases where the lens was visible it seemed to undergo a decrease of lustre. Slit-lamp examination of the cornea shows thickening of its nerve fibres with resulting anaesthesia. With regard to aetiology, the author is convinced that dietetic errors are the cause of the condition. None of his patients had eaten meat, green vegetables or any food containing vitamin A for weeks and yet had been doing hard physical labour. In former descriptions of the disease great stress has been laid on diarrhoea as a cause of the condition but in the author's experience it is a symptom, due to degeneration of the intestinal mucous membrane, consequent on absence of vitamin A from the dietary. General symptoms comprise moderate pyrexia (98·6 to 100·2° F. in ordinary cases and up to 104° F. in severe cases), decrease of haemoglobin in the red cells and an increase of polymorphonuclears, and change of colour and texture of the skin, the colour ranging from a faded grey to greyish yellow and the surface being rough, dry and desquamating. Cracks and wrinkles appear in it which frequently become infected with organisms producing abscesses with very little inflammatory reaction. The hair becomes dry and falls out, while the nails are seamed with furrows. Mucous membranes other than the conjunctiva and internal mucosa may also be affected. Thus, the mouth becomes dry, hoarseness develops, bronchitis and even broncho-pneumonia may occur and in one case there was a non-gonococcal urethritis.

F. A. W-N.

BOOK NOTICES

Kurzes Handbuch der Ophthalmologie. Edited by F. SCHIECK and A. BRÜCKNER. Berlin: Julius Springer. 7 Vols. 138.6 marks per volume.

Volume I.—Anatomie, Entwickelung, Missbildungen, Vererbung. Pp. 882. 422 illustrations. 1930.

Volume V.—Gefässhaut, Linse, Glaskörper, Netzhaut, Papille und Opticus. Pp. 744. 466 illustrations. 1930.

It may seem somewhat strange that a series of seven portentous volumes should be presented under the title of a "Short Handbook," but the reason perhaps lies in a comparison with the immensely overgrown handbook of Graefe-Saemisch-Hess. But whatever surprise may be felt at seeing the book from afar, it can only give way to admiration when its contents are studied. So far as can be judged by the two volumes which are now to hand, this handbook

represents the best in German ophthalmology, and we await the others with interest.

The first volume is made up of sections dealing with anatomy, embryology, congenital deformities and heredity. The section on the anatomy of the eye, the orbit, the skull and the base of the brain, which is contributed by Eisler, of Halle, occupies 349 pages, is illustrated by 111 drawings, and includes 38 pages of references. It is filled with detailed information taken from all sources, including macroscopic and microscopic anatomy, slit-lamp appearances, and the pictures obtained with vital staining, the whole being annotated with an abundance of reference-quotations, not confined as in the case of many text-books to the well-annotated writings of the past, but including most of those of importance up to recent years. It is difficult to pick out any single section for special note: the whole is a monument to the industry of its author. The second section on the central nervous connections of the visual apparatus, which occupies 115 pages, maintains the high standard of the first. It is written by Professor Pfeifer, of Leipzig, a recognized authority in this field. Beginning with a résumé of the anatomical and experimental methods employed in elucidating the central nervous system, it deals with the lower visual paths and primary centres, the upper visual paths and cortex, the central connections of the ocular muscles, the sympathetic and parasympathetic nerves and ends with a short note on the connections of the eyes with the spinal cord. The subject is treated in a comprehensive and philosophical way, and in the many places where our knowledge is by no means complete, the writer has refrained from allowing himself be to carried away by facile theories, but has preserved the balance which every text-book should strive to maintain. It is fitting that Seefelder, of Innsbrück, should have undertaken the section on embryology. In comparison with the others this is somewhat short, occupying 38 pages, and there are passages wherein alternative views are perhaps not given due prominence, such as, for example, the development of the cornea and the anterior chamber. This section is followed by an account of general deformities of the eye and its associated structures, wherein the views of Seefelder are shortly and concisely described. The last section on heredity, which occupies 225 pages, including 43 pages of bibliography, will come as a surprise to those who are not acquainted with the immense amount of research which has been conducted upon the inheritance of disease. The section starts with a general review of the Mendelian theory and its special applications to man; each anomaly and disease of the eye which has shown any hereditary tendency (and it would appear that there are remarkably few which do not) is then taken up *seriatim* and dealt with in detail, with an abundance of references to literature plentifully illustrated with family trees, many of which

include hundreds of individuals. The reviewer knows nothing in the ophthalmological literature of this subject so complete and so intensely informative as this, and even if the wealth of detail which is showered upon the reader may appear somewhat superfluous in a book of this kind, the industry with which the author, Franceschetti, of Basle, must have applied himself to his task will certainly excite admiration.

The fifth volume (which is the second to appear) is entirely clinical and pathological; and includes diseases of the uvea contributed by Gilbert, of Hamburg, diseases of the lens and of the vitreous body by Jess, of Giessen, diseases of the retina by Schieck, of Würzburg, and of the optic nerve by Rönne, of Copenhagen. It is true that in these sections the exhaustive completeness found in the first volume is lacking; this is an eminently good thing, for it must be remembered that while the literature of the more scientific branches of ophthalmology found in the first volume is large, that of the clinical subjects is impossible to cope with. But almost in every case the literature which has been chosen shows great discrimination, embracing the modern as well as the old, and containing many more references to the work done in countries outside Central Europe than is usual in German publications. It is impossible to deal with the various articles separately within the compass of a short review, and it is difficult to pick out separate sections for special praise or criticism, as the standard reached by all of them is high. An extremely good and typical chapter is that on the lens, where the whole subject is treated with commendable brevity and yet fully from the chemical, physiological, pathological and clinical points of view, and which includes an able summary of the vast amount of scattered observations which have been added through slit-lamp examination within recent years.

Regarding it as a whole the production is an excellent one, yet it is not without defects. These to some extent are dependent upon its nature. Unless the editing is controlled in an unusually strict manner, in a series of volumes written by a multitude of authors on a subject abounding in controversy such as ophthalmology, contradictions are bound to occur. The individual authors in this case seem to have been left a considerable latitude in the expression of their own opinions; and while the result may lead to some confusion, more especially to the reader who is not acquainted with the personalities of the literature and the opinions which some of them hold more or less strongly, yet it carries the advantage that each opinion is that of an authority deserving interest and commanding attention. There is a further defect—or perhaps a characteristic which is exemplified in much of the literature in Central Europe. The handbook is more of an encyclopaedia than a text-book; in many places it is more a summary and abstract of the literature than

a constructively critical analysis of it; it reminds one rather of an *Ergebnisse* which one uses as a jumping-board from which to start one's reading than of a text-book with the aid of which one hopes to clarify one's confusion of thought and come to a definitely reasoned opinion on one's course of action (A thinks this, B thinks that, C this other, but what am I to think?); in richness of information it is admirable, but in philosophy, constructive or destructive, it is lacking. Finally, in the manner of its printing, publishing, and illustrations, it is magnificent, but in spite of these facts its price appears to us to be exorbitant. Each volume costs 138.6 marks or approximately £7, and the whole handbook £50. This is to be regretted, for the book, so far as the two volumes which have appeared go, deserves a wide circulation; but to put a prohibitive price upon its productions seems to be a characteristic of modern German publishing. This may be a profitable policy in the country of its adoption, but it must of necessity tend to limit the circulation of those products which would otherwise be large to the scientific libraries in those more unfortunate countries in which ophthalmology would appear to meet with less ample monetary rewards.

Ultra-violet Radiations and their Uses. By ROBERT AITKEN. Pp. 208. 15 illustrations. Edinburgh: Oliver and Boyd. 1930. 10/6.

A very readable and practical handbook on the uses and the technique of ultra-violet radiations has appeared from the pen of Dr. Aitken, the lecturer in dermatology in the university of Edinburgh. Introduced by a short foreword by Sir Norman Walker, the book ranges over a very wide field, giving the reader a survey of the physical and biological effects of radiation (we did not realize that the physics of light was so simple a matter before), the clinical apparatus and dosage which may be employed in the therapeutic application of light, the contra-indications and risks of treatment, and the many various diseases in which this method of therapy is now employed—in general surgery and medicine, tuberculosis, diseases of the nervous system, gynaecology, diseases of children, diseases of the skin, ear, nose, throat, eye and teeth. Nor does the list end here, for mention is made of the application of radiations in veterinary surgery, poultry farming, in the irradiation of food-stuffs, and so on. Covering such a wide range it is necessary that the subject matter be very much condensed, and, such being the case, we should have liked to have had more of the author's own experiences. If we were to criticize on the manner of the presentation of much of the subject matter, it would be to say that a large part of the book is a series of short summaries of the

conclusions of various writers (many of them in themselves biassed and uncritical) that this and the other disease is benefited by light treatment, with little attempt at a reasoned or critical analysis of their opinions. The impression the reader is apt to gather is that ultra-violet light is a panacea for all manner of things: and this the author definitely agrees, it is not. As one would expect, the best part of the book deals with diseases of the skin and tuberculosis. The section on diseases of the eye is short, and, while giving little help in the technical details of the treatment of ophthalmological cases, it draws attention to the considerable number of diseases in which benefit may accrue from this method of treatment. There is one small point which requires correction: the painful reaction following direct exposure of the eye to short-waved light is due to a keratitis rather than to a conjunctivitis.

The author speaks with authority on those branches of the subject of which he has had considerable experience. He brings forward several cogent arguments against the adverse opinion expressed in the report of the Medical Research Council in 1928, and points out that the single experiment upon which this was based can be subjected to very fair criticism. His plea that those who have no special knowledge of the subject cannot hope to dabble in it with any degree of safety is also sound; but his remedy, that light therapy should be incorporated in the medical curriculum as a compulsory subject, probably errs in the direction of over-enthusiasm, and overlooks the still greater danger of its administration by the laity.

There are several books of this kind now upon the market; and the present one certainly ranks among the best.

NOTES

Deaths

We regret to announce the death at Freiburg of Professor Theodor Axenfeld on July 29. A fuller notice will appear in the next issue.

We regret to announce the death at Stockholm of Professor Allvar Gullstrand in his 68th year. Though well known for his many publications on the dioptrics of the eye, a subject for which he was awarded the Nobel Prize in 1911, Gullstrand's name is most closely associated by ophthalmologists with the slit lamp, the reflexless ophthalmoscope and the use of hyperbolic spectacle lenses.

He was born at Landskrona, in Sweden, and received his education at the universities of Upsala, Vienna and Stockholm. At

the last of these, he held the chair of ophthalmology and then of physiological and physical optics.

Though the slit lamp may not have revolutionised ophthalmology in the way the ophthalmoscope did, yet its use has added very largely to our knowledge of eye conditions and it is an instrument with which we could ill afford to dispense. Had it not been for the pioneer work of this eminent ophthalmologist and ophthalmic physicist, the instrument would still be unknown and the greatest of recent advances in diagnostic procedure would not yet have been made. The world of ophthalmology therefore owes a great debt to this great man whose loss we deeply regret.

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Honour

MISS IDA MANN has been invited by the Wilmer Institute and by the Post Graduate Medical Centres of New York, Chicago and Denver to deliver a series of lectures on the Evolution of the Eye.

FUTURE ARRANGEMENTS

1930

October 7.—Midland Ophthalmological Society, at Birmingham.
December 2.—Midland Ophthalmological Society, at Birmingham.

CONTEMPORARY OPHTHALMIC LITERATURE

American Journal of Ophthalmology. *July, 1930.*

PARKER and CULLER. Lipemia retinalis.
BENEDICT and BRODERS. Adenocarcinoma of the lacrimal gland.
HOLLOWAY. Electric cataract.
THEOBALD. The frequency of sympathetic ophthalmia.
POOS. Optic neuritis secondary to post-nasal sinus disease.
KEMLER. The etiology of lacrimal disorders.
BARKAN. Pepys' eye complaint,

Archives of Ophthalmology. *May, 1930.*

CUSHING. The chiasmal syndrome of primary optic atrophy and bitemporal field defects in adults with a normal sella turcica.
GOLDSTEIN and WEXLER. Acute tuberculous periphlebitis of the retina and optic nerve.

FRIEDENWALD. The pathogenesis of acute glaucoma: 1. Clinical and pathologic study.
FRIEDENWALD and PIERCE. The pathogenesis of acute glaucoma: 2. Experimental study.
HUGHES. Stereoscopic photography as applied to the eye.
FUCHS. Localization of pathologic changes in the cornea.

June, 1930.

MACCALLAN. Ocular disease and local sepsis.
SCHOENBERG. The Gonin operation for detachments of the retina.
FOX. Causes of failure in ophthalmic operations.
CUSHING. The chiasmal syndrome of primary optic atrophy and bitemporal field defects in adults with a normal sella turcica. *(Concluded.)*
CULLER and WALLS. Ectopic cone nuclei.
MARTIN. Acute ocular pemphigus. Report of a case.
PARDEE. Herpes zoster ophthalmicus luetica.
APPLEMAN. Retinitis punctata albescens.
EAMES. Ocular aspects of conditioned reflexes.

Annales d'Oculistique. *June, 1930.*

GOLOVINE. On the diagnosis and operative treatment of tumours of the orbit.
TERSON. On adenoidal and appendicular states in follicular conjunctivitis of adolescence.
DE POPPCU. Professor Bellarminoff.

Archives d'Ophtalmologie. *June, 1930.*

TERRIEN and CHARAMIS. On tumours of the pouch of Rathke.
PECH. The physiological and clinical value of chromatic aberration.
VAN LINT. Some details of intra-capsular extraction of cataract.
MICHAIL. Unilateral angiospastic paralysis of the 4th nerve with bilateral papilloedema following a blow on the occiput.
VEIL. On the action of natural ephedrine on the eye.

Revue Internationale du Trachome. *April, 1930.*

TRAPESONTZEWA. Is the virus of trachoma filterable?
BEDIER. Trachoma in Laos.
BELOT. Trachoma in the military marines of North Africa.
TALBOT. Importation of trachoma into Italy from Egypt since the 13th century.

Archiv für Ophthalmologie. *July, 1930.*

ISHIKAWA. Experimental glaucoma in dogs with certain references to diseases of the optic nerve.
MÜLLER. The frequency and form of anterior axial suture cataract and anterior axial embryonic cataract.
TABORISKY. The Provaczek-Halberstadt corpuscles and their clinical meaning.
PILLAT. On prexerosis and xerosis of the cornea as individual clinical parts of deficiency disease of the eye in adults.
FISCHER. On the separation of the lens from the ectoderm in man.
SONDERMANN. On the development and morphology of the canal of Schlemm.
TRON. An observation on our knowledge of the refraction curve.

Klinische Monatsblätter für Augenheilkunde.

June, 1930.

KOYANAGI. The occurrence of ophthalmoscopic findings in chorioretinitis nephritica.
ROHNER. Retinitis with good prognosis.
BIELSCHOWSKY. An uncommon case of vertical heterotopia of the maculae.
LEVINSOHN. On my theory of the pathology of papilloedema.
GOLDMANN. A new familial retrobulbar neuritis.
ELSCHNIG. Hernia of orbital fat, so-called " tear sac " of the under lids.
RAUH. Leaf or rosette-shaped cataracts.
CURTIUS and DE DECKER. Hereditary tendency of relapsing 3rd nerve paralysis.
WAARDENBURG. Anisometropia and corneal refraction.
——— On the possibility of modification of corneal refraction.
SZEKELY. Sickle shaped broadening of the cornea in the region of the palpebral aperture.
BIRCH-HIRSCHFELD. The black cloth edge : a simple contrivance in perimetry.
SATTLER. Prisms in the early treatment of concomitant squint.
COMBERG. On the technique of the trans-scleral magnet operation.
HAMBURGER. Observations on the pathological physiology of the eye.
v. RÖTTH and KLEIN. The lens capsule in intra-capsular extraction of cataract.
ELSCHNIG. Enucleation with subsequent exenteration.
KRANZ. A spool canula for cleaning the conjunctival sac.
ALISSOW and LIPOWITZ. The search for a specific treatment for trachoma.
ALTSCHUL. Clinical experiences with my method of radiological localisation of intra-ocular foreign bodies.
SEEIN. Blepharo-chalasis of the lower lid.

Zeitschrift für Augenheilkunde. *July, 1930.*

BEHR. Papilloedema in experimentum crucis hominis.
BIBERSTEIN. The residual irritability in ocular therapy.
JAENSCH. Disturbance of the eye muscles in myasthenia.
SAFAR. An ophthalmoscope for the examination of the periphery in Gonin's treatment of detachment of the retina.
DWIJKOFF and LEWKOEWA. Cytology of the conjunctiva in trachoma and the problem of its pathogenesis.
KUNII. On a familial tree of blue sclerotics and the grounds for their theoretical inheritability.
MUSIAL. A case of endothelioma of the eyelid.

Archivio di Ottalmologia. *March-April, 1930.*

GALLENGA. Observations on a case of electric ophthalmia.
ALAJMO. The present state of the modern physico-chemical theory of glaucoma.

Bollettino d'Oculistica. *June, 1930.*

DE LOGU. On a case of massive lympho-sarcoma originating in the lacrimal caruncle with commencing invasion of the orbital connective tissue.
ARACRI. Argyrosis of the lacrimal sac.
SANTORI. Primitive diffuse astrocyte glioma of the optic nerve.
BUSSOLA. Embolus of the central artery of the retina and secondary glaucoma.

Archivos de Oftalmologia Hispano-Americanos.

July, 1930.

CARLIN. Aetiology of papilloedema.
RUBBRECHT. The closing of holes in the retina.
ORTIN. Pathology of the anterior chamber of the eye.